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Tuberculin Purified Protein Derivative (P.P.D.) in the Double Intradermal Test in Cattle—Preliminary Observations

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While the work which introduced the double intradermal tuberculin test for cattle (Medical Research Council Report, 1928) was based on the use of concentrated old tuberculin, the advantages of a synthetic medium tuberculin were soon realised (Buxton and Glover, 1933) and this type of product is now in general use. Attempts to produce a more highly purified tuberculin have met with success and, in this connection, the work of Seibert (1928, 1932, 1933, 1934) has been of particular value. It culminated in the production of "purified protein derivative" (P.P.D.), the purest form of tuberculin yet available. Linggood and Parish (1938) in a recent article, reprinted in this journal (v. **50**, p. 637), described the preparation of this agent in these laboratories.

The writers have had a supply of P.P.D. placed at their disposal for preliminary observations on its use in the double intradermal test of cattle. Two batches have been used and each has been prepared from the growth of a strain of the human type of the tubercle bacillus on the synthetic medium of Long and Seibert. This is a preliminary communication and it is anticipated that further work with P.P.D. prepared from the bovine type of the bacillus will be possible in the near future.

Where the term P.P.D. is used in this article it denotes a solution of that product of a potency equal to that of International Standard Tuberculin, as judged by the intracutaneous test in guinea-pigs, and P.P.D./2, P.P.D./3, P.P.D./4 and P.P.D./6 indicate a solution at, respectively, one-half, one-third, one-quarter and one-sixth that potency. Two batches of Department of Agriculture, U.S.A., mammalian tuberculin (hereafter termed U.S.A.), kindly presented by Dr. Mohler, several batches of ammonium sulphate precipated synthetic medium tuberculin prepared in these laboratories (hereafter termed L.C.), and similar tuberculin obtained from the Royal Veterinary College (hereafter termed C.T.) have been compared with P.P.D. The potencies of these tuberculins according to guinea-pig tests were approximately: U.S.A., one-half; L.C., one-third; and C.T. (Batches 50.5, 59.5 and 60) one-quarter that of International Standard Tuberculin.

The technique of the double intradermal test has been adhered to but, in addition to taking measurements, the quality of the positive reactions was recorded at the 48th and 72nd hour by awarding an appropriate number of plus signs. This additional record has been found of value when comparing different tuberculins. Measurements often do not sufficiently illustrate the differences observed because one tuberculin may tend to produce swellings of some size yet poor in character—in the diffusion typical of a positive reaction—whereas another may give smaller measurements but marked oedema. A standard has been adopted and one or more plus signs awarded each positive reaction according to the extent of the oedema present. In most groups of reacting cattle tested with P.P.D. and other tuberculins the average measurements and total number of plus signs are set out in tables to illustrate the differences observed.

The quantity of the first batch of P.P.D. (2223 A) available for cattle testing was limited. Several observations on small groups of known clean cattle showed that it produced in them practically no swelling or just a small soft pea. On a group of tuberculous cows P.P.D. was used simultaneously with P.P.D./2, U.S.A. 650, two batches of L.C. and one of C.T. (Batch 50.5). Judged by this test P.P.D. was equal in potency to U.S.A. tuberculin and P.P.D./2, approximately equal to L.C. and distinctly stronger than C.T.

The second batch of P.P.D. (2212 B) has been available in considerable quantity and has been used in all subsequent work.

Observation I.—In the seven clean cows of the laboratory herd P.P.D. gave little swelling at the site of injection, but it was noted that such swellings were soft in consistency.

Observation II.—A group of twelve known

reactors of low sensitivity, as judged by a test with three tuberculins five months previously, were simultaneously tested with P.P.D., U.S.A. 668, L.C. and C.T. (Batch 55). Each tuberculin produced a positive reaction in each of these cows and the findings are summarised below (Table I).

Table I

The Simultaneous Testing with Four Tuberculins of Twelve Known Reactors.

Tuberculin.	Average Measurements.			Number of Plus Signs.	
	Pre.	48 hours.	72 hours.	48 hours.	72 hours.
U.S.A. ...	6·0	12·4 (8*)	14·6	22	30
L.C. ...	6·0	8·0 (4*)	11·3	5	17
P.P.D. ...	6·2	11·6 (7*)	12·8	17	29
C.T. ...	6·0	7·8 (2*)	10·7	2	11

* = Number of cows not reinjected.

The positive swellings to P.P.D. were markedly soft and oedematous. The oedema showed a distinct tendency to spread and the measurements hardly do justice to the quality of the reactions to it. It was concluded that this P.P.D. was almost equal in potency to U.S.A. 668 and much more potent than L.C. or C.T.

Observation III.—A herd from which tuberculosis was being eradicated—all the animals then remaining had passed to L.C. and to C.T. three months previously—was simultaneously tested with P.P.D. and with C.T. (Batch 55). Of the 105 cattle tested, 99 were negative and one was positive to both tuberculins. Four positive and one doubtful to P.P.D. were negative to C.T.—a disagreement rate of 4·3 per cent. The negative swelling to P.P.D. was generally just noticeable or a small soft pea, but in four instances both it and the swelling to C.T. were larger than usual, in three instances the P.P.D. swelling only, and in two the C.T. swelling only was larger than usual. Twelve other cows of the same herd were simultaneously tested with P.P.D., C.T. (Batch 55), U.S.A. 668, and L.C. Eleven gave characteristic negative reactions to each of the four tuberculins, the average skin measurements for these animals are set out in Table II.

Table II

The Simultaneous Testing with Four Tuberculins of Eleven "Clean" Cows.

Tuberculin.	Average Measurements.		
	Pre.	48 hours.	72 hours.
P.P.D. ...	5·8	6·2	7·2
C.T.	5·7	6·8	7·9
U.S.A. ...	5·5	6·0	6·8
L.C.	5·6	6·4	7·3

The character of the negative swelling to each tuberculin was excellent but it was noticed that P.P.D. and U.S.A. generally gave rise to less swelling and that, like the swelling to L.C., it was soft in consistency and contrasted somewhat with the firm pea-like swelling to C.T. The remaining cow had been introduced from an attested herd four weeks previously and it gave small positive reactions to each tuberculin.

Observation IV.—Thirty-five cows which had been turned out of a herd from which tuberculosis was being eradicated as reactors or doubtful reactors to C.T., were simultaneously tested with P.P.D., P.P.D./2, L.C. and C.T. (Batch 59.5). Two of these animals did not react to any of the four tuberculins and Table III summaries the results of the tests of the remaining 33. It will be seen that only three of these cows (the same three) were negative to P.P.D. and to P.P.D./2 at the 48th hour; four were negative to L.C. and 21 then showed no reaction to C.T. At the 72nd hour all were positive to P.P.D. and to P.P.D./2, while one was negative to L.C. Seven were negative and nine doubtful to C.T. The disagreement rate between the P.P.D. tuberculins and C.T. was 48 per cent. Re-examination at the 96th hour showed no material change in the reaction to

Table III

Summary of Results in Testing Thirty-three Known Reactors simultaneously with four Tuberculins.

Tuberculin.	Average Measurements.			No. of Plus Signs.		Reaction.†	
	Pre.	48 hours.	72 hours.	48 hours.	72 hours.	48 hours.	72 hours.
P.P.D. ...	5·9	15·4 (25*)	18·2	63	72	25 R. 5 D. 3 N.	33 R.
P.P.D./2 ...	5·8	13·3 (23*)	16·0	48	59	23 R. 7 D. 3 N.	33 R.
L.C.... ...	5·8	11·1 (17*)	13·9	31	46	17 R. 12 D. 4 N.	32 R. 1 N.
C.T.... ...	5·8	8·5 (4*)	11·6	6	18	4 R. 8 D. 21 N.	17 R. 9 D. 7 N.

* = Number of cows not reinjected.
† R = Positive; D = Doubtful; N = Negative.

any tuberculin in any animal. The reactions to P.P.D. and to P.P.D./2 were not markedly different and were regularly superior to those to the other tuberculins. On this evidence P.P.D./2 certainly appeared sufficiently potent for cattle testing. If only reaction to C.T. were accepted as indicating infection with the tubercle bacillus, it would be concluded that even P.P.D./2 was too potent and likely to cause pseudo-reactions in clean cattle. Since all these animals had previously given a positive reaction to C.T., and since other work (Montgomerie and Thomson, 1938) has shown that some tuberculous cattle do not react to tuberculin of that potency, there is no reason to suspect that the reactions to P.P.D. were not genuine. The two animals which did not react to any tuberculin had been turned out of the herd as "doubtful" to C.T.

Observation V.—Each animal of a tuberculin-tested herd, 96 cows and nine calves, was simultaneously tested with P.P.D./2 and with C.T. (Batch 59.5). This herd had been established for many years but was not entirely self-contained and at a test three months earlier one cow introduced on a certificate, and two home-bred animals, reacted to C.T. All the 105 animals were now negative to both tuberculins, the average increase in measurement being smaller for P.P.D./2. The swellings were carefully examined as to quality and it was observed that P.P.D./2 frequently gave a slight general thickening or just a small soft swelling which was in contrast with the firm pea or bean of C.T. In seven cows the negative swelling was not entirely typical to either tuberculin, in ten others it was larger than usual to P.P.D./2 only, and in nine others it was larger than usual to C.T. only. The 17 cows whose negative swelling to P.P.D./2 was atypical were retested on the other side of the neck one week later, P.P.D./2 being injected at one site and the P.P.D. diluent at another. In no case did the diluent cause any definite swelling or any increase in the skin measurement; in twelve the P.P.D./2 site was typically negative, in two it was slightly larger (an increase of 3 mm.) than normal, and in two the swellings were not negative in character. In one of these a trace of oedema was present and the measurements were 7, 9, 11 mm. The reaction was considered doubtful. In the other, a small oedematous positive reaction of 5, 7 and 11 mm. was recorded. These two animals were later tested with U.S.A. 668, P.P.D./2, L.C., C.T., avian tuberculin and control fluid for the latter. Both gave a positive reaction (6, 12, 18 and 5, 9, 15) to avian tuberculin only. It appeared that the potency of P.P.D./2 was such that it tended to cause small reactions in these animals probably infected with the avian tubercle bacillus only.

Observation VI.—A group of 15 cows selected at random in a herd composed of reactors, removed from tuberculin-tested herds in the same ownership, were simultaneously tested with P.P.D./2, P.P.D./3, P.P.D./4, P.P.D./6, L.C. and C.T. (Batch 60). When a cow has entered this herd it is housed continually until, on completion of its useful milking life, it is sold for slaughter. For some years the buildings have contained tuberculous cattle only and during this time several animals have been slaughtered under the Tuberculosis Order. The exact history of the 15 selected cows is not known, but each had been in the herd for many months and must have been repeatedly exposed to infection during that period.

Table IV

The Simultaneous Testing of Fifteen Known Reactors.

Cow.	Tuberculin.	Pre.	48 hours.	72 hours.	Reaction.
1	P.P.D./2	5	11 D.	21 D.	Positive
	P.P.D./3	5	11 Sl.	19 D.	,,
	P.P.D./4	5	9 Tr.	14 D.	,,
	P.P.D./6	5	9 Tr.	14 D.	,,
	L.C.	6	8 Tr.	12 D.	,,
	C.T.	6	7	8 C.	Negative†
2	P.P.D./2	6	17 D.*	18 D.	Positive
	P.P.D./3	6	14 D.*	16 D.	,,
	P.P.D./4	5	12 D.*	13 D.	,,
	P.P.D./6	4	13 D.*	14 D.	,,
	L.C.	6	13 D.*	15 D.	,,
	C.T.	6	9	12 D.	,,
3	P.P.D./2	6	25 D.*	35 D.	Positive
	P.P.D./3	6	22 D.*	27 D.	,,
	P.P.D./4	5	17 D.*	24 D.	,,
	P.P.D./6	6	13 D.*	15 D.	,,
	L.C.	6	24 D.*	39 D.	,,
	C.T.	6	12 D.*	15 D.	,,
4	P.P.D./2	5	10 D.*	15 D.	Positive
	P.P.D./3	5	11 D.*	14 D.	,,
	P.P.D./4	5	10 D.*	12 D.	,,
	P.P.D./6	4	'8 Tr.*	10 D.	,,
	L.C.	6	11 D.*	15 D.	,,
	C.T.	5	8 Tr.*	10 D.	,,
5	P.P.D./2	4	7 D.	11 D.	Positive
	P.P.D./3	4	7 Sl.	10 D.	,,
	P.P.D./4	4	6	9 D.	,,
	P.P.D./6	4	7	10 D.	,,
	L.C.	4	7 Sl.	11 D.	,,
	C.T.	4	7	8 Tr.	Doubtful†
6	P.P.D./2	6	14 D.*	15 D.	Positive
	P.P.D./3	8	18 D.*	19 D.	,,
	P.P.D./4	5	10 D.*	12 D.	,,
	P.P.D./6	5	10 Sl.*	10 D.	,,
	L.C.	6	8 Tr.*	10 D.	,,
	C.T.	6	10 Sl.*	9 D.	,,
7	P.P.D./2	7	13 D.*	11 D.	Positive
	P.P.D./3	7	11 D.*	13 D.	,,
	P.P.D./4	8	14 D.*	12 D.	,,
	P.P.D./6	6	10 Sl.*	12 D.	,,
	L.C.	8	12 D.*	11 D.	,,
	C.T.	7	9	10 C.	Negative†

Table IV (Contd.)

Cow.	Tuberculin.	Pre.	48 hours.	72 hours.	Reaction.
8	P.P.D./2	6	18 D.*	24 D.	Positive
	P.P.D./3	5	17 D.*	22 D.	,,
	P.P.D./4	5	15 D.*	19 D.	,,
	P.P.D./6	5	14 D.*	15 D.	,,
	L.C.	5	17 D.*	21 D.	,,
	C.T.	4	10 D.*	12 D.	,,
9	P.P.D./2	4	18 D.*	22 D.	Positive
	P.P.D./3	4	15 D.*	20 D.	,,
	P.P.D./4	4	14 D.*	22 D.	,,
	P.P.D./6	4	14 D.*	15 D.	,,
	L.C.	4	16 D.*	23 D.	,,
	C.T.	4	10 D.*	13 D.	,,
10	P.P.D./2	5	12 D.*	20 D.	Positive
	P.P.D./3	5	12 D.*	16 D.	,,
	P.P.D./4	5	10 D.*	15 D.	,,
	P.P.D./6	4	10 Sl.*	12 D.	,,
	L.C.	5	8 Sl.*	13 D	,,
	C.T.	5	7	10 D.	,,
11	P.P.D./2	5	8 Tr.	12 D.	Positive
	P.P.D./3	6	10 D.	13 D.	,,
	P.P.D./4	5	7 Tr.	10 D.	,,
	P.P.D./6	6	7	10 D.	,,
	L.C.	6	7	11 D.	,,
	C.T.	6	7	8 C.	Negative†
12	P.P.D./2	6	12 D.*	16 D.	Positive
	P.P.D./3	6	16 D.*	17 D.	,,
	P.P.D./4	6	10 D.*	12 D.	,,
	P.P.D./6	6	12 D.*	13 D.	,,
	L.C.	6	12 D.*	16 D.	,,
	C.T.	6	9 Tr.	14 D.	,,
13	P.P.D./2	4	12 D.*	20 D.	Positive
	P.P.D./3	5	11 D.*	15 D.	,,
	P.P.D./4	4	10 D.*	14 D.	,,
	P.P.D./6	4	10 D.*	14 D.	,,
	L.C.	4	11 D.*	20 D.	,,
	C.T.	4	6	10 D.	,,
14	P.P.D./2	5	11 D.	15 D.	Positive
	P.P.D./3	5	11 D.	15 D.	,,
	P.P.D./4	6	9 D.	12 D.	,,
	P.P.D./6	6	10 Sl.	11 D.	,,
	L.C.	5	7 Tr.	11 D.	,,
	C.T.	6	8	9 C.	Negative†
15	P.P.D./2	7	11 D.	18 D.	Positive
	P.P.D./3	7	12 D.	17 D.	,,
	P.P.D./4	6	7	11 D.	,,
	P.P.D./6	6	7	11 Tr.	,,
	L.C.	6	9 Tr.	14 D.	,,
	C.T.	6	8	11 Tr.	,,

Tr. = Trace of diffusion; Sl. = Slight diffusion; D = Diffusion; C = Circumscribed; * = No second injection.

† *C.T. Reading at 96th hour* :—

Cow 1—10 Sl. Positive.
,, 5— 7 C. Negative.
,, 7—11 Tr. Positive.
,, 11— 8 C. Negative.
,, 14—11 Sl. Positive.

Table IV sets out the detailed results. Where, at the 48th hour, it was necessary to reinject any one of the P.P.D. sites all the other sites were reinjected. Thus the more potent P.P.D. tuberculins were, on occasion, reinjected although the swelling was already clearly positive. Ten of the cows gave a positive reaction to all six tuberculins. Each of the other five reacted to the P.P.D. tuberculins and to L.C., but one was doubtful and four were negative to C.T. at the 72nd hour. The P.P.D. tuberculins and L.C. were, therefore, in complete agreement but C.T. disagreed to an extent equivalent to 33 per cent. The swellings were inspected and measured at the 96th hour when each reaction swelling of the 72nd hour was still obvious. The cow previously doubtful to C.T. was plainly negative, and three of the four previously negative then showed small reactions to that tuberculin.

Table V (*see opposite page*) summarises the results by giving, for each tuberculin, the average measurements, the total number of plus signs awarded for quality, and the number of the three classes of reaction observed. There could be no hesitation in grading these tuberculins, according to their potency judged by this cattle test, in the following order: P.P.D./2, P.P.D./3, L.C., P.P.D./4, P.P.D./6 and C.T. It did appear that P.P.D./3 was sufficiently potent for use in the double intradermal test and that it was almost equal to the L.C. tuberculin which was recently used in extensive field trials (Montgomerie and Thomson, 1938). P.P.D./2 appeared to have no material advantage over P.P.D./3, but further dilution did have some disadvantage. The suggestion of the earlier work, that C.T. might fail to detect some infected animals, was confirmed. It is of particular interest to note that P.P.D., even at one-sixth International Standard Strength was, on this cattle test, more potent than that tuberculin. Even at the 48th hour all these cows were positive or suspicious to P.P.D./2 and P.P.D./3.

Observation VII.—The 95 cows in a tuberculin-tested herd were simultaneously tested with P.P.D./3 and with C.T. (Batch 60). This herd is largely maintained by the introduction of heifers or cows which have recently passed the tuberculin test. Tuberculosis was reintroduced some 18 months previously, apparently through the purchase of a non-reacting infected cow, and since then, despite short-interval testing with C.T., the herd had not been free from reactors at any test. With a view to assisting the cleaning up of this herd, the writers tested, with L.C. and with C.T., all the animals three months prior to this test. Reactors to L.C. were removed, but since then other cattle, certificated as having passed the tuberculin test, had entered the herd.

The results of this simultaneous test and the average measurements for the various groups of cattle were:—

TABLE V
The Simultaneous Testing of Fifteen Known Reactors—Summary of Results.

Tuberculin.	Average Measurements.			No. of Plus Signs.		Reaction.†		
	Pre.	48 hours.	72 hours.	48 hours.	72 hours.	48 hours.	72 hours.	96 hours.
P.P.D./2	5·3	13·3•	18·2	31	44	14 R. 1 D.	15 R.	15 R.
P.P.D./3	5·6	13·2•	16·9	28	39	13 R. 2 D.	15 R.	15 R.
P.P.D./4	5·2	10·7•	13·4	17	26	10 R. 3 D. 2 N.	15 R.	15 R.
P.P.D./6	5·0	10·3•	12·4	14	19	10 R. 2 D. 3 N.	15 R.	15 R.
L.C.	5·4	11·4•	16·1	22	37	10 R. 4 D. 1 N.	15 R.	15 R.
C.T.	5·4	8·5Ø	10·6	5	12	5 R. 1 D. 9 N.	10 R. 1 D. 4 N.	13 R. 2 N.

• = Ten animals, no second injection; Ø = Five animals, no second injection; † R = Positive; D = Doubtful; N = Negative.

	Pre.	*48hr.*	*72hr.*
82 Negative agreements			
P.P.D./3	5·4	5·8	6·8
C.T.	5·2	6·4	7·6
4 Positive agreements			
P.P.D./3	6·7	11·5	14·5
C.T.	5·7	6·2	12·2
5 Disagreements—			
P.P.D./3 pos./C.T. neg.			
P.P.D./3	5·6	8·4	11·2
C.T.	5·2	6·4	8·2
3 Disagreements			
P.P.D./3 doubt./C.T. neg.			
P.P.D./3	6·3	8·6	11·0
C.T.	5·6	7·0	7·6
1 Disagreement—			
P.P.D./3 neg./C.T. doubt.			
P.P.D./3	5·0	6·0	6·0
C.T.	5·0	6·0	9·0

The disagreement rate was 9·5 per cent.

The quality of the swellings among the 82 animals negative to both tuberculins was carefully determined. In 72 the swellings to P.P.D./3 and to C.T. were typically negative; in six they were atypical to both tuberculins; in four the swelling was atypical to P.P.D./3 only, and in four atypical to C.T. only. The quality of the positive reactions to P.P.D. where there was agreement was more markedly in excess of that to C.T. than the figures suggest.

Observation VIII.—The 29 cows and one bull in a tuberculin-tested herd were simultaneously tested with P.P.D./3 and C.T. (Batch 63). This herd belongs to the owner of that used in Observation VII and receives from the latter all animals which react to the agglutination test for *Br. abortus*. Occasional reactors have been detected at successive tests with C.T. over a long period. At the last test, three months previously, L.C. and C.T. were used and four reactors were removed.

There were no reactors to either tuberculin on this occasion and the average measurements were;—

	Pre.	*48hr.*	*72hr.*
30 Negative agreements			
P.P.D./3	5·5	5·6	6·3
C.T.	5·4	6·6	8·0

The negative swelling to P.P.D./3 was typical except in two cows in each of which the increase in skin measurement was 3 mm. and the swelling to C.T. above the average, namely, 4 mm. and 3 mm.

Discussion

The urge of recent years has been towards the production of tuberculin which would be as free as possible from non-specific material. Since old tuberculin is derived from a veal-infusion-peptone broth on which the tubercle bacillus has grown, it contains much non-specific material of a protein character. The introduction of tuberculin prepared by growing the bacillus on a synthetic medium marked a considerable advance. All the protein it contains has been formed during the growth of the organism. It is generally accepted that the active principle of tuberculin is protein in nature and various methods of purifying and concentrating that principle have been investigated. The ammonium sulphate precipitation method (Buxton and Glover, 1933) is the one now commonly adopted in this country in the preparation of tuberculin for use in the double intradermal test. The method of preparation of P.P.D., involving ultrafiltration and trichloracetic acid precipitation of heat-concentrated synthetic medium tuberculin followed by dehydration and removal of the trichloracetic acid with ether, is accepted as giving the purest product yet available. The tuberculin testing of cattle has now assumed such an important place in veterinary practice in this country that the employment of the tuberculin of highest purity in the testing of cattle is greatly to be desired.

P.P.D. has advantages other than that of purity. It is obtainable as a dry protein powder which is very stable and is, therefore, particularly suitable as a "standard" tuberculin with

which veterinary tuberculins may be compared. A considerable bulk of the dried powder may be made at one time, sufficient to test many thousands of cattle. When the potency for cattle has been determined, fresh supplies may be made up periodically which will be of exactly the same strength.

More detailed investigation of the specificity of synthetic medium tuberculins produced from different strains would be possible were they prepared as P.P.D. With ordinary tuberculins it often cannot be determined whether differences in potency are due to variation in the concentration of tuberculo-protein or to lack of specificity. Any variation in the potency of batches of P.P.D. made up in solution at the same concentration may, later, be shown to be due to specificity. The P.P.D. used in these observations was prepared from a single human strain and the work which has been planned with material prepared from the bovine type of the tubercle bacillus may materially further our knowledge of the specificity of tuberculin.

P.P.D. has the advantage that it may be made up in solution in a borate or phosphate buffer which is isotonic and at the *p*H of body fluids, whereas "synthetic medium tuberculin" is generally of distinctly lower *p*H. There is evidence that the buffer solution injected intradermally as is tuberculin in the double intradermal test causes no detectable swelling.

The stability of P.P.D. in solution at the potency which may be used for cattle testing has not been investigated. All tuberculins made up at the strengths normally used for human testing deteriorate comparatively rapidly but at the potency commonly employed for cattle testing are much more stable. In any case, P.P.D. would not normally be stored in the wet state in any considerable quantity.

It is essential that any tuberculin for use in cattle testing be shown to have no obvious tendency to produce pseudo-positive reactions in clean cattle. Particularly potent tuberculin does appear to possess this disadvantage. The writers have been highly critical in their examination of the swellings produced by P.P.D. in "clean" cattle. They have evidence that P.P.D./2 may occasionally produce small positive reactions in animals apparently infected with the avian type of bacillus, but they have no clear evidence that P.P.D./3 has any marked tendency to cause reaction-like swellings in animals presumably free from tuberculosis. It is appreciated, however, that the typical negative to P.P.D. differs somewhat from that to C.T. In its tendency to produce a soft swelling P.P.D. resembles the L.C. and U.S.A. tuberculins. This may be regarded as a disadvantage since some may fear that the abnormally large negative (say 3 mm. increase in skin thickness), being circumscribed yet soft, might be confused with a positive swelling showing just a little oedema. These "unsatisfactory" negative swellings probably vary in their incidence from herd to herd as does, apparently, the large negative to C.T. Whether they are the result of some slight general protein sensitisation is at present unknown and whether they can be avoided by the use of more specific tuberculin remains for further investigation. On the evidence available it need not be anticipated that they will be particularly troublesome when P.P.D. of suitable potency is used.

Since P.P.D. has certain obvious advantages over other types of tuberculin, if, as has previously been contended, there exists a need for further study of the potency of tuberculin for use in the double intradermal test, much advantage would attach to its inclusion in such an investigation. On the basis of this work it may be suggested tentatively that P.P.D. at a potency one-third that of International Standard Tuberculin, judged by guinea-pig intracutaneous tests, is suitable for use in this test.

The absence of any record of the *post-mortem* examination of animals which have been tested with P.P.D. may tempt some to suggest that even the cautious expression of the opinion set out above is hardly justified. The writers believe that much valuable information may be obtained by the simultaneous testing with several tuberculins of animals whose history is known, but they appreciate that the *post-mortem* examination of a long series of animals so tested constitutes the final court of appeal. Such *post-mortem* work must be carried out under conditions approaching the ideal before it can serve any critical purpose. In these circumstances, they feel that this work should be in the hands of a body of experts provided with full facilities and ample funds so that, in the end, conclusive results may be obtained. During the course of this preliminary work they have, however, had the opportunity to examine *post-mortem* two cows which had been tested with P.P.D. Both of these animals were mentioned in a previous communication (Montgomerie and Thomson, 1938, p. 1768), and then known as cows 6 and 7. Cow 6 when first tested had given a positive reaction to L.C. but only a delayed positive reaction to C.T. Three weeks later this animal gave a typical negative swelling to C.T., but a good positive reaction to U.S.A. and L.C. tuberculins. On this occasion she was also tested with P.P.D., P.P.D./2, P.P.D./4 and P.P.D./8, and reacted to each. After the lapse of three months from the original test this animal gave a small positive reaction to C.T. and a very marked reaction to U.S.A., L.C. and P.P.D. tuberculins. The only abnormality found on *post-*

mortem examination was a small tubercle-like nodule in one submaxillary gland. This was proved by microscopic, histological and biological examinations to be tuberculous and due to the bovine type of tubercle bacillus. The history of cow 7 had been supplied by Dr. J. A. Wilsdon, then C.V.O., Herefordshire. She was a member of a herd which had been free from reactors at four tests with C.T. covering a period of one year. This cow had, however, been shown to be giving tuberculous milk. Professor Dalling carried through a test with several tuberculins of which the details, excepting those for P.P.D., were given previously. P.P.D. gave a positive reaction quite equal to that of U.S.A. and superior to L.C., but the C.T. sites were again negative. On *post-mortem* examination widespread tuberculosis of the mesenteric glands and tuberculosis in other sites, including the supramammary gland and udder, was demonstrated.

There exists a certain body of veterinary opinion which would prefer a single rather than a double intradermal test. P.P.D./2 has been employed to a limited extent in the caudal fold test, single injection of 0·1 c.c. and reading at the 72nd hour, during the course of this work. It has regularly given very satisfactory negative and positive swellings in agreement with the readings of the double intradermal test. The caudal fold would not be selected as a site of preference in this country were an equally sensitive and more convenient one available. A review of the results with P.P.D. at various potencies does suggest that very few reactors injected with this tuberculin, at or above one-third International Standard strength, in the skin of the neck fail to show either an obvious positive reaction or a very suspicious swelling at the 48th hour. The opportunity to leave all positive and suspicious swellings, without reinjection, to be read at the 72nd hour has not arisen. Since the writers believe that low sensitivity often causes only a delay in the appearance of positive swelling, they would suggest that a profitable line of work would be the determining of the proportion of reactors which would escape detection when a single dose of potent tuberculin, say P.P.D./3, is injected and the results read at the 72nd hour. If such a simplification of the intradermal tuberculin test in cattle could be accepted the advantages would benefit the community considerably and facilitate the planning of the campaign for the eradication of bovine tuberculosis.

Summary

(1) Tuberculin Purified Protein Derivative (P.P.D.) prepared from a human strain of the tubercle bacillus has been employed at various potencies in testing, by the double intradermal method, 426 cattle; 352 believed to be free from tuberculosis and 74 known positive reactors to the test.

(2) Ammonium sulphate precipated synthetic medium tuberculin obtained from the Royal Veterinary College (C.T.) has always been used simultaneously, and similar tuberculin prepared in these laboratories at Langley Court (L.C.) and Department of Agriculture, U.S.A. Mammalian Tuberculin (U.S.A.) has occasionally also been employed.

(3) P.P.D. in clean cattle gave little or no swelling or only a soft pea. In this it resembled L.C. and U.S.A., but was in contrast with C.T. which produced a much firmer swelling.

(4) P.P.D. in solution at a potency equal to that of International Standard tuberculin, judged by intracutaneous guinea-pig tests, appeared equal in potency, in cattle tests, to U.S.A., approximately three times more potent than L.C. and at least six times more potent than C.T.

(5) P.P.D. at one-third International Standard potency appeared suitable for use in the double intradermal test of cattle. It detected animals of low sensitivity and did not readily produce pseudo-reactions in clean animals.

(6) It is suggested that P.P.D. possesses advantages over the tuberculins previously used and should be included in any future investigation of the potency of tuberculin for use in the double intradermal test.

(7) With a sufficiently potent suitable tuberculin a single injection into the skin of the neck may detect as many reactors as does the double intradermal test.

Acknowledgment

Dr. R. A. O'Brien has constantly encouraged and assisted the writers throughout this work. Dr. F. V. Linggood has prepared the P.P.D. and the L.C. tuberculins used, and Dr. H. J. Parish has carried out the titrations on guinea-pigs. Mr. R. C. U. Fisher, M.R.C.V.S., D.V.S.M., who placed several of the herds at our disposal, assisted at the reading of the tests in these instances.

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ADDENDUM

Since the foregoing was submitted for publication, further work has shown that two recent batches of C.T. are much more potent than any which have been used previously in simultaneous testing. All the earlier batches had a guinea-pig potency which varied little around one-quarter International Standard Tuberculin. The potency of batch 62, however, was approximately equal to, and that of batch 63 approximately one-half that of International Standard Tuberculin. These differences have also been apparent when testing in cattle; batch 62 giving more intense reactions than P.P.D./3 and much more intense reactions than L.C., while batch 63 gave smaller reactions than P.P.D./3, almost equal to those given by L.C. It is, therefore, necessary to emphasise that the comparisons detailed above (with the exception of those in the clean herd used for observation No. 8) were made with batches of C.T. whose potency was that accepted by the writers as "normal" for that tuberculin; namely, about one-quarter that of International Standard Tuberculin as judged by the guinea-pig intracutaneous test.

ANIMAL WELFARE

"It was a lucky day for the 'Cinderella of the professions' when young Hobday, half-a-century ago, decided to join it," says the *Lancet* in a recent issue, writing of Sir Frederick Hobday's book which we reviewed in our issue of December 10th, 1938. "No Cinderella could have had a more faithful Prince. His enthusiasm permeates his book* which tells of what has been done for sick animals. Through veterinary science, glanders and rabies have been eradicated from this country, distemper made preventable, and foot-and-mouth disease brought under control. Much, however, remains to be done, and in view of the number of diseases transmissible from animals to man closer liaison is still required between the medical and veterinary professions—*e.g.*, the endowment of one or more university chairs in comparative medicine. Sir Frederick has much to relate of the dangers of veterinary quackery and of the disreputable tricks, such as 'beaning' and 'bishoping,' of a certain type of horse-coper. Equally interesting are his War reminiscences and his scarcely credible tales of animal intelligence. He writes of past and present cruelties to animals and rightly condemns steel-gins but, like others, offers no better alternative than cyanogen fumigation which has but a limited sphere of usefulness. The most heartening chapter to many will be that which describes the resurrection of the Royal Veterinary College, in which the author played so large and energetic a part. This book is to be commended alike to doctors, veterinarians, and all who have at heart the welfare of the other animals."

*Fifty Years a Veterinary Surgeon. By Sir Frederick Hobday. London; Hutchinson and Co. 1938. Pp. 288. 10s. 6d.

Improvements in the Technique of Tuberculin Testing

W. D. BLANCHARD, M.R.C.V.S.,
Leominster

Mr. Hancock's article on Tuberculin Testing in your issue of January 7th, 1939, interested me very much, as I expect it has interested many others, as this work is so very much to the fore at present. They may agree with us that there is room for improvement in both technique and instruments.

May I offer a small contribution from the practical side, in the hope that others will follow suit.

I practise in a rearing district, where the majority of the animals are reared running out with their mothers, and about 75 per cent. of the stock have never been tied up, coming into a shed only during the winter.

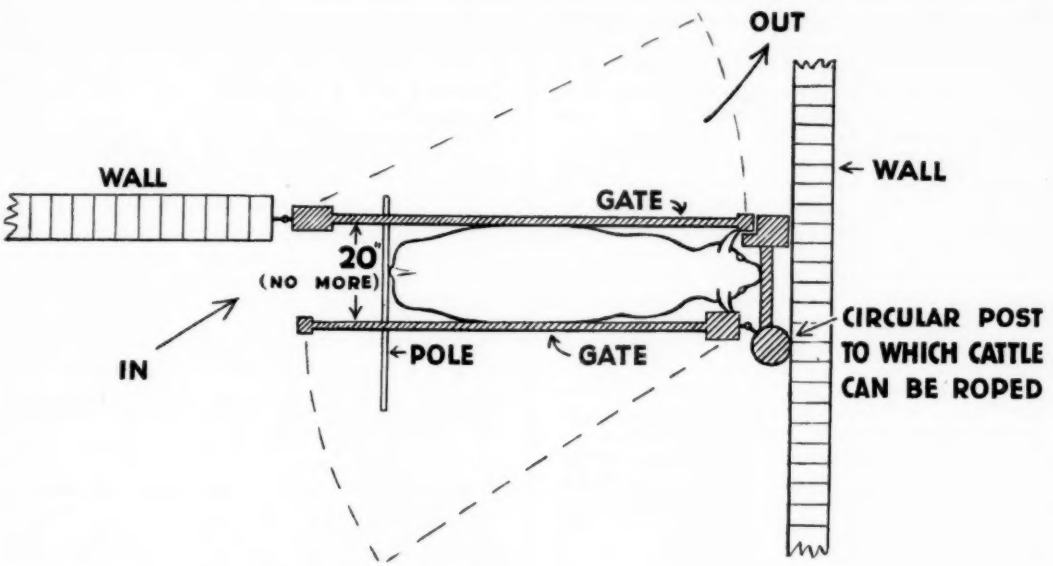
In the open shed we work on a struggling animal at the end of a rope which distorts the position and tension of the skin at the site of injection, while in the cowhouse we work in semi-darkness, squeezed up between two objecting cows. We cannot improve the lighting of the buildings and in my experience a torch is not a satisfactory solution; take your eyes for a moment off the site you have just clipped and see how hard it is to pick it up again; and how the light reflects off the metal calipers when you try to read the measurements. How different is the work in daylight with the animal in a natural pose.

I have been greatly helped since Dr. A. J. Wilsdon, our Divisional Inspector, mentioned that a stockbreeder in the County had a useful device. Knowing this gentleman he mentioned, I asked if I might see it and he had since given me permission to pass on information concerning it.

It is a device for restraining the animal and one good feature is that the necessary parts are to be found on every farm; it consists of two gates hung to open in opposite directions, and I find a space of 20 in. between them ample for the largest cows; this measurement should not be exceeded.

For choice, take a yard that has a gate opening outwards, hang the other gate to open in the opposite direction, so that when both gates are open there is a clear road through, and when closed they should be parallel.

The less the animals are driven about the easier they are to handle; in most cases it pays to get a wagon or two to make a corral or fence leading up to the gates. You can then draw out two or three cows or half a dozen



FOLD YARD

yearlings—they draw better in a bunch—and hold them with the aid of the wagons close up to the gates, as if they are used to going through the gate, when it is held ajar they move towards it. As soon as the cow passes the man holding the inside gate he closes and simultaneously the man at the outer gate does the same, while a third man slips a pole through the bars of both gates immediately behind the animal and a chain slipped over the top prevents their coming apart. In practice I find this is all the restraint necessary, but I always keep a rope with a metal ring noose handy to secure the animal to the post in front should it show any signs of giving trouble. One difficulty, especially with young stock, is that they get their heads down trying to find a place to creep out; to prevent this a pole is passed under the neck and the head being lifted, the pole is retained in position through the opposite gate.

When using the wagons to hold up a few cattle, it will be found that as soon as you release the one in the gates another tries to follow it through. One great secret of smooth working is to see that the pole is slipped in behind immediately the animal stops, for once it runs back it does not like coming up again. Another tip is to release them into another yard or confined space, if possible. Sometimes an animal will go through too quickly for the man at the outer gate, and in this event it is possible to drive it back, whereas if the space is not confined one might have a long wait. Another advantage of the confined space is that those waiting to come through see their companions on the other side of the gate and are anxious to join them.

Up to now we have been working in the open, but I have devised and used a modification of the same trap to work under cover. In a typical instance, I had to test 57 animals at a farm off the beaten track, the only help was from the owner and his son of 18. I decided to use a shed about 45 ft. long with three doors opening on to the fold yard. This shed had a manger and hay rack running its full length opposite the doors, tie beams crossed in the usual manner to support the roof and the hay rack was supported by posts about 6 ft. apart, I selected a beam which was over one of these posts about 10 ft. from the end of the building and asked the owner to put in a good post which was let into the floor and secured to the beam overhead for rigidity. A field gate was hung on this post and slip rails were put between the new post and the post supporting the hay rack. The building was about 14 ft. wide and before I started I fastened one end of a second gate with wire to the middle door, supporting the other end with a pole jammed against the wall and lashed to the gate. This took up about 8 ft., enabling the hinged gate when opened to overlap it. The animals were driven in to the far end of the shed, one drawn out, and driven to the gate which the father

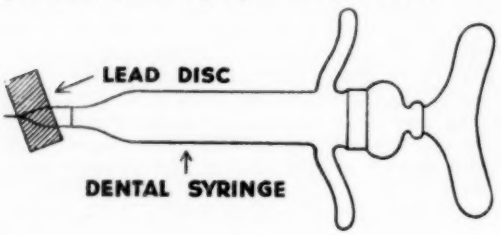
pushed tight against it, while the son slipped a pole through the gate behind it. There was a good light from the open door 10 ft. away. We had no occasion to rope a single one and the only time they had to be held was to read the tattoo number in the ear. There were only six calves out of the 57 and besides the cows there were some big strong stores two years and over. If we had had to rope each one in the usual manner it would have taken very much longer with the limited help available.

As regards instruments, to deal first with the syringe, I use a 1 c.c. dental syringe costing about 30s. This is very dear, but I have not found anything I like better. I carry three round with me.

I have found that the screw thread holding the needle, although fastened with a spanner, occasionally will work loose and if this is not discovered in time some animal may escape the proper dose. Generally your experience tells you that the pressure you are exerting on the syringe is wrong; sometimes you notice the syringe is sticky or the needle appears slightly bent, but this ought not to occur with good metal and workmanship.

I like Mr. Hancock's suggestion of one turn to a dose and it is quite feasible; I find with mine that the threading of the piston is such that I cannot rely on the adjustment without careful scrutiny and when I have squeezed my way up between two cows and the light is bad it is maddening to have to come away to set the syringe to do the other.

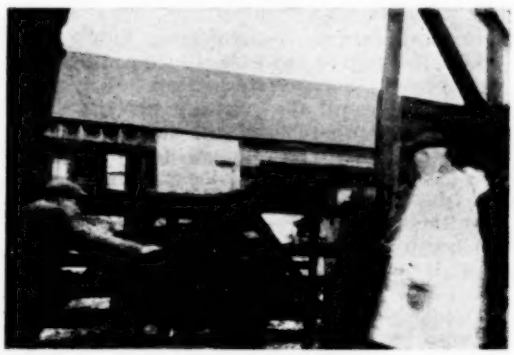
Here is an idea which I hope others will try. I have fixed a metal disc to the nut holding the needle to the nozzle of my syringe. This insures the needle entering at an angle and not going beyond a fixed depth. The disc, which is made of lead, is about ½ in. in diameter; I made it of lead because as an amateur I could make and shape this to my liking. I tried setting it at various depths and angles till I got what I liked, but naturally various breeds require various depths. A mechanic could easily make this gadget adjustable. The syringe can be used boldly without hesitation, as the disc end will not let the needle puncture too deeply. The disc can be kept pressing against the skin till the dose has been inserted, so making sure that none is lost. If the situation requires it you can use the syringe with one hand.



Now as to the calipers, I have put in a lot of work over these, trying to make improvements. I made a pair and tried to get them manufactured but I failed, so that my modified pattern has not had the chance of extensive trials in the field; I still like the idea, however, and it is here described for anyone to improve upon.

One arm of the calipers moved a rack and pinion, which in turn moved the hand on a dial the size of a wrist watch. It was an easy matter to show the measurements magnified on this dial by passing the movement through gear wheels of different ratio, and you could read your measurements almost anywhere. Secondly, a rachet was added which allowed the calipers to open to their maximum whilst passing over the swelling and then locked them. The point of these calipers consisted of three balls, one enclosed in the gap of the other two, a sort of claw, the idea being to prevent movement of the part measured and to get the maximum diameter of the part enclosed. I have often thought that a pair of sugar tongs represents the better idea, but have not tried this.

The two ball points as ordinarily used are not inclined to remain over the greatest diameter of a circumscribed swelling, they tend to slip over the side of it; as an experiment, take the point of a gelatine capsuled physic ball and try to close the calipers on it. Put in another way, the two ball point calipers often slip to the edge of a swelling, measuring an arc instead of the greatest diameter.



I hope I have been able to make these ideas of mine intelligible to my readers, and some may find them helpful. For myself, I find tuberculin testing a very responsible task which, in addition to professional skill and experience in interpretation, requires constant vigilance if error is to be avoided. We require all the help we can be given in the way of improved restraint, light and instruments, and I trust these will be forthcoming.

Avian Tuberculosis in the Cow

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(*Continued from page* 198)

[In the previous section of this paper, the isolation of the avian type of tubercle bacillus from the milk of a cow affected with tuberculous mastitis was dealt with.]

Section II—UDDER IMPLANTATION EXPERIMENTS

Object of the Experiments

The object of these experiments was to ascertain the pathogenicity of the isolated tubercle bacilli for the bovine mammary gland.

These experiments were restricted to two cows, Nos. 11 and 105, each of which had been in the laboratory experimental herd for ten and three years respectively. These animals had been previously subjected to the double intradermal tuberculin* (bovine) test on October 21st, 1935, and to a repeat test on January 7th, 1936, performed simultaneously with the double intradermal tuberculin (avian) test on the same side of the neck with a negative result.

EXPERIMENTS.—Cows 11 and 105 were each inoculated with 30 mg. of a third subculture on glycerine agar 30 days old, originally derived from the right popliteal gland of guinea-pig 911, suspended in 50 c.c. of sterile saline solution, into the milk sinus of the right posterior quarter of the mammary gland by the teat duct, on March 6th, 1936.

At the time of experiment, cow 105 was in full lactation and suckling a calf. Cow 11 had been dry for several months and non-pregnant. Clinical examination of each udder revealed no abnormalities. Before injection, cow 105 was milked dry and after injection was isolated from her calf for 24 hours. Both cows were liberated to separate paddocks.

TUBERCULIN TESTS

One June 23rd, 1936, the two cows and suckling calf were clinically examined and tuberculin-tested with avian and bovine tuberculin. No clinical abnormalities were observed in the udder of either cow and the calf was thriving well.

Tuberculin (Bovine) Test	Injected. mm.	48th hour. mm.	72nd hour. mm.	Dose 0.1 c.c. Result.
Cow 11	8	10	13 S.O. (32 × 22mm.)	Positive
Cow 105	8	10	8	Negative
Calf of cow 105	10	10	10	Negative

Tuberculin (Avian) Test	mm.	mm.	mm.	Dose 0.2 c.c.
Cow 11	8	22 D.O.	40 D.O. (100 × 55mm.)	Positive
Cow 105	6	8	8	Negative
Calf of cow 105	13	14	13	Negative

Abbreviations D.O. and S.O. denote diffuse oedema and slight oedema.

The only reacting animal in this experiment was cow 11 which gave a positive reaction to both tuberculins, a slight reaction to bovine and a very spectacular reaction to avian. The reaction to bovine tuberculin requires some comment in as much as, though the skin measurements only showed an increase of 5 mm., there was a definite zone of oedema 32 × 22 mm. which undoubtedly classed it as a positive reaction. It is probable that some practitioners would regard it as only a doubtful reaction. There was no reason for assuming that this animal had become infected with bovine tubercle bacilli in the interval between the respective tests and the correct solution can be explained on the basis of a group reaction.

As judged by the tuberculin tests on June 23rd, 1936, cow 105 had eliminated infection and the calf had not become infected. The elimination of infection in this cow was no doubt favoured by the process of lactation and the calf must have received during the process of sucking a large number of the inoculated bacilli which apparently did not establish infection, or if so, of only a very short duration. The reacting animal, cow 11, most probably reacted owing to her being non-lactating, the inoculum being allowed to remain undisturbed in the milk cistern. The inoculated quarter of the udder showed no clinical signs of mastitis. It has already been noted that the cow was non-pregnant at the time of inoculation, but it was afterwards mated on March 24th, 1936, and again on July 28th, 1936.

COW 11.

UDDER EXAMINATION.—The udder was again clinically examined on September 28th, 1936, and revealed no evidence of mastitis. The right hind quarter (the inoculated one) was in a state of complete involution with no evidence

*The avian tuberculin used was concentrated tuberculin made by the Pasteur Institute, and the bovine tuberculin (the synthetic medium type) obtained from Cambridge.

of fluid at the base of the teat. With considerable difficulty drops of blood-stained fluid, about 0·5 c.c. in all, were expressed from the teat into a small sterile test tube. Examination of the remaining quarters and drawing of the teats into tubes revealed a honey-like secretion in the right fore and left hind quarters, and a watery milk-like fluid in the left fore quarter.

Microscopical examination of smears from the injected quarter showed one clump of acid-fast bacilli whilst other fields showed occasional clumps of blue-staining short bacilli, many of them rounded at the ends and some club-shaped. In these clumps several bacilli showed a dull red staining, suggesting the losing of acid-fast characters. Leucocytes of the granulocytic type were very numerous in the examined smears.

Tuberculin Test.—The cow was subjected to the double intradermal tuberculin (avian) test 215 days after inoculation, with the following result:—

Cow 11—Dose 0·1 c.c.

Injected	*48th hour*	*72nd hour*	*Result*
8mm.	13mm. D.O.	24mm. D.O.	Pos.

It will be observed that a marked allergic response could still be evoked. Although the measurements were not so great as on the previous test, the increases in the skin measurements were by no means proportional to the areas of oedema which were of considerable surface area size but ill-defined at the borders as these merged into the normal skin.

Cultural Examination of Udder Exudate.—Culture tubes of plain egg and 5 per cent. glycerine agar were sown from a 2·5 per cent. NaOH suspension of exudate obtained from the inoculated udder quarter on September 28th, 1936, and again from exudate obtained on October 6th, 1936, resulting in a pure growth of tubercle bacilli appearing in several tubes whilst a few showed contamination with a streptococcus. The colonies were fairly numerous in some tubes, scant in others and showed great variation in size. The colonial growths had all the morphological characters of the avian type of tubercle bacillus.

Biological Examination of Exudate from Individual Udder Quarters.—At this stage it was considered of sufficient interest to ascertain if infection had spread to any of the remaining udder quarters.

Four very young rabbits were each inoculated intramuscularly into the right thigh with a suspension in saline of the udder exudate obtained from the individual quarters 258 days subsequent to udder implantation. They were killed after 81 days. *Post-mortem* examination revealed no trace of disease in three of the rabbits, but in the rabbit inoculated from the right hind udder quarter there were slight but progressive lesions of tuberculosis, consisting of caseo-purulent areas in the subcutaneous and intramuscular tissues of the inoculated limb, purulent synovitis of the right tibio-femoral joint, moderate enlargement of the right popliteal lymph node which was studded with pinhead caseous centres, marked enlargement and oedema of the right sublumbar lymph node (11 × 9 mm.) which disclosed a few caseating areas pinhead in size. There were no other abnormalities and the carcase was excellently nourished.

Stained smears prepared from joint exudate, right popliteal and sublumbar lymph nodes revealed numerous acid-fast bacilli comprising long and short forms.

Rabbit Cultures.—Culture tubes of plain egg and 5 per cent. glycerine agar were sown from the joint exudate, resulting in a luxuriant crop of colonies in all tubes. The cultural growths were pure and typically avian in morphological and physical characters.

It would appear from the results of the biological and cultural experiments that the infection in the udder was localised and that the organism did not exhibit any marked invasive powers for the bovine tissues of this particular animal.

The allergic condition of the animal to the avian and bovine types of tuberculin was again demonstrated 334 days after infection resulting in the following positive reactions:—

Avian—

Skin	*48th hour*	*72nd hour*
0·2c.c.	6mm.	16mm. D.O. 20mm. D.O. (7×5·2cm.)

Bovine—

Skin	*48th hour*	*72nd hour*
0·2c.c.	6mm.	11mm. S.O. 14mm. D.O. (4×3cm.)

The reason for employing twice the dose recommended for bovine (synthetic) tuberculin was to have the inocula comparable as regards volume in view of the subsequent measurements.

The animal gave birth to a fully developed dead calf after a gestation period of 294 days. *Post-mortem* examination of the calf disclosed a fair quantity of non-coagulated blood in the peritoneal cavity, the lungs were solid and sank in water and the heart showed some petechiae and was pale in colour. There was no gross evidence of tuberculous lesions in carcase. The placenta was normal in appearance.

Examination of the cow revealed no deviation from the normal and colostrum samples from the respective quarters showed no alteration in appearance on standing for some hours and minimal deposit after prolonged centrifugation.

Ziehl-Neelsen stained smears of centrifuged deposits were negative for acid-fast bacilli.

Post-mortem Examination of Cow 11.—The animal was slaughtered when 440 days under

experiment. It was in excellent bodily condition and presented no macroscopical evidence of tuberculosis. The intact udder with attached lymph nodes were removed to the laboratory for detailed examination. Large diffuse and multiple areas of fat necrosis were present. A thorough examination of the udder by repeated slicing subsequent to syphoning off the colostrum samples revealed no abnormality except for a slight area of fibrosis in the upper portion of the left gland immediately adjacent to the septum and abdominal wall. In this fibrotic zone there were several isolated yellow-coloured areas. On section they were non-solid and exuded a yellow fluid resembling colostrum. They were regarded as strangulated portions of the mammary secreting tissue. A microscopical examination of the fluid did not reveal any acid-fast organisms. The inoculated quarter and that half of the udder showed neither exaggerated lobulation nor nodule or ulcer formation in its substance, lactiferous ducts, or milk sinus. The two glands were perfectly pliable and soft except at the area of fibrosis already mentioned. The retromammary lymph nodes were normal in appearance, size and texture.

Biological Examination of Retromammary Lymph Nodes and Colostrum.—This examination was thought desirable for two reasons, namely, to ascertain if infection was still present, and if present, to ascertain the points of localisation.

Retromammary Lymph Nodes.—Two guinea-pigs (753 and 754) were each inoculated intramuscularly with 2·5 c.c. of a heavy suspension in broth of each of the respective retromammary lymph nodes and, killed 105 days later, were in excellent bodily condition with no evidence of disease on *post-mortem* examination.

Two fowls (29 and 32), previously twice tuberculin tested, were each inoculated intramuscularly with 12 c.c. of a very heavy suspension in broth of each of the respective retromammary lymph nodes. A tuberculin test applied on September 27th, 1937, and also at an earlier date were both negative. They were killed after 139 days for *post-mortem* examination, with no evidence of tuberculosis in either bird, both of which were in very good condition.

Colostrum.—Colostrum samples were collected aseptically in 100 c.c. sterilised tubes and centrifuged at approximately 1,500 r.p.m. for 30 minutes before collecting the cream and deposit for inoculation purposes. Four rabbits (670, 671, 672 and 673) were each inoculated into the right thigh muscles with 2·5 c.c. of a suspension of the deposit in cream and were autopsied 140 days later, resulting in a complete absence of lesions in animals inoculated from the right fore, left fore and left hind udder quarter. The fourth rabbit (671), inoculated from the right hind quarter, showed slight lesions of tuberculosis of a progressive type. These consisted of a number of yellowish caseating areas, some containing calcareous granules situated in the intermuscular and subcutaneous tissues of the inoculated limb. The right sublumbar lymph node was moderately enlarged, oedematous, and disclosed a number of yellow caseating areas. One kidney displayed a grey nodule, barley grain in size, with a yellow centre projecting from the cortex. No other lesions of tuberculosis were present.

Ziehl-Neelsen smears of sublumbar lymph node and local lesions disclosed tubercle bacilli to be frequent in the former and sparse in the latter. The bacilli were mostly short and slender.

Culture tubes of 5 per cent. glycerine agar and 5 per cent. glycerine serum were sown direct from the local lesion, resulting in an excellent crop of colonies on the glycerine serum medium and a good colonial growth in half of the glycerine agar tubes. Morphologically the cultures had definite avian characters and were slimy to the touch. Microscopical examination revealed them to be pure cultures of the tubercle bacillus.

These biological experiments proved that the organism, although in residence and viable in the bovine mammary gland for 440 days, did not produce any macroscopical evidence of disease on *post-mortem* examination and failed to be demonstrated in the retromammary lymph nodes or in the secretion of any quarter of the udder other than the inoculated one.

Fowl Inoculations with the Organism Recovered from the Mammary Gland

At the time of autopsy of rabbit 671 it was decided to ascertain if the rabbit lesions were virulent for the fowl owing to the long (440 days) residence of the organism in a bovine host and accordingly the following inoculations were made.

Two fowls (380 and 30) which had been tuberculin tested on several previous occasions and retained in isolation were each inoculated intramuscularly with 5 c.c. of a suspension of the local lesion and sublumbar lymph node lesion of rabbit 671 and were killed after 215 days for *post-mortem* examination.

Fowl 380 was extremely emaciated and signs of diarrhoea were present. There was an extensive stratified caseo-necrotic local lesion. The thymus showed caseo-necrotic lesions on both sides of the neck ranging upwards in size from that of a peanut. The liver was ochre yellow in colour and peppered with minute grey nodules about 0·5 mm. in diameter. The spleen was moderately enlarged and studded with minute grey nodules. Both lungs showed numerous caseo-necrotic nodules irregular in

shape and varying in size, one being as large as a small pea. The heart presented a few caseous nodules and the gizzard one such lesion. Sagittal section of the tibio-femoral articulations disclosed central yellow caseous nodules varying in size from pinhead to small pea.

Ziehl-Neelsen stained smears of the liver and bone marrow lesions disclosed numerous clumps of tubercle bacilli both scattered and in clump formation.

Fowl 30 was in excellent condition and showed on *post-mortem* examination a large extensive fibrotic area at inoculation site containing small isolated caseo-necrotic areas. The thymus lobes disclosed pinhead and slightly larger caseo-necrotic areas. There were no other lesions of disease. Ziehl-Neelsen smears of the weal and thymus lesions revealed numerous tubercle bacilli.

Culture tubes of 5 per cent. glycerine agar and 5 per cent. glycerine serum were sown from the liver of bird 380, resulting in pure and typical avian cultural growths.

The above experiments proved that the organism had not lost its pathogenicity for the fowl and had still retained its avian cultural characters.

DISCUSSION (Section II)

The cultural implantation experiments on the cows' (105 and 11) udders demonstrated the lack of invasive powers of the isolated avian strain. The lactating animal (cow 105) as judged by the tuberculin test cleared itself of infection within 107 days. Its suckling calf, tested simultaneously, was non-allergic in spite of the fact that it most probably received during the process of sucking the greater portion of the inoculum. It may be presumed that both the dam and calf eliminated infection rather quickly.

With regard to the non-lactating cow (11), the subsequent history proved more interesting in that an allergic response to tuberculin was evident at the first test applied 107 days following inoculation and was still in evidence when last tested, a period of 334 days. The response to the homologous tuberculin was always greater than that to the heterologous product and suggests the use of both types of tuberculin when occasion demands it, *e.g.*, in so-called low positive or doubtful reactors to bovine tuberculin.

These group reactions in cattle have been well noted and remarked on by several workers, notably Plum (1931), Minett (1932), Feldman and Schlotthauer (1935), and Glover and Griffith (1936), and they are of great importance to the practitioner who uses the intradermal method of tuberculin testing herds. One occasionally hears of the anomalous results obtained by experienced practitioners in using the intradermal test; it is highly probable that many of the so-called doubtful reactions and animals in which a slight positive reaction is recorded at one time, only for the next test to disclose a frank negative, are due to sensitisation of the bovine tissues by members of the acid-fast group of bacteria other than the bovine tubercle bacillus. It may be suggested that the avian bacillus may be found to be one of the principal offenders in this group in certain areas owing to the prevalence of tuberculosis of poultry and the system of animal management practised. In this connection Schalk (1928) has shown experimentally that cattle may become temporarily sensitised to avian tuberculin by exposure to reacting fowls kept under natural conditions.

The organism was demonstrated in the secretion of the inoculated quarter of the udder at periodical intervals during life by cultural and biological inoculation, and also at time of slaughter 440 days following artificial infection. Infection was not demonstrated in any of the remaining udder quarters, neither was it demonstrated in the regional lymph nodes. There were no demonstrable naked-eye changes evident on *post-mortem* examination, nor was there any alteration in the appearance of the colostrum.

This finding appears to be one of the characteristics of avian infection in that infection may be present in tissues in the absence of any demonstrable naked-eye lesions and such animals will give a definite and pronounced reaction to avian tuberculin. This has been the experience of Plum (1931), Minett (1932), and other workers.

The organism recovered during life and at time of slaughter possessed the usual avian cultural characteristics.

The experiment proves that the avian bacillus may establish itself and be capable of living a parasitic existence in the non-lactating bovine mammary gland for a considerable period without the production of any macroscopic changes. It is presumed that the infection remained localised to the inoculated quarter in view of the negative biological tests with the remaining samples of colostrum and retro-mammary lymph nodes. Microscopical lesions were probably present owing to the long residence of the bacillus but pressure of other scheduled work did not allow of sections being prepared. The persistent allergic response to the intradermal injection of tuberculin in the absence of any macroscopical evidence of disease was interesting. On reflecting for a moment on the reacting mechanism concerned in the tuberculin response in the experimental cow 11 one is inclined to speculate that the local reaction was no doubt occasioned by the sensitisation of the skin cells by the products arising from the interaction between the bacilli and surrounding mammary cells, resulting in

the elaboration of some substance or substances which were being gradually and constantly carried away to the remaining parts of the body by the lymph and/or blood channels and which conferred on those cells after a certain period the capacity to react by the exhibition of an inflammatory phenomenon on the introduction of tuberculin. The reaction may be interpreted as a protective response on behalf of the tissues of an infected animal and perhaps as a parallel to what occurs in Koch's phenomenon.

The evidence obtained as a result of the cultural and biological tests indicated that the cultural and pathogenic characters of the organism had not altered. It was not anticipated that any alteration in this respect would be noted in view of the negative results obtained by Griffith (1911 to 1931) in experiments with the avian bacillus recovered from the mammary gland of an inoculated goat and likewise with the human bacillus recovered from the mammary gland of an inoculated cow. In both series of experiments Griffith found that the organisms were unaltered after long sojourns in the tissue and tissue fluids of their alien hosts.

The organism originally isolated was of standard virulence for the fowl and it is of interest to note that its virulence had not altered for the fowl despite the long sojourn in bovine tissues. The evidence, however, was against such a change owing to its virulence when first isolated, previous to which it must have been a long time in residence in its bovine host.

In many respects the results of the cultural implantation udder experiments recall to memory those of Griffith in his experiments for the Royal Commission on Tuberculosis, on the pig with the avian bacillus and on the dog with the human bacillus where it appears to be difficult to produce the disease experimentally and yet natural cases of tuberculosis due to these types are frequently encountered. This discrepancy between the results of experimental and natural infection still remains to be explained but is most probably inherent in the problem of biological variations in host and parasite.

Summary (Section II)

(1) Implantation experiments with cultures of the isolated organism were performed on the udders (lactating and non-lactating) of two non-tuberculin reacting cows without the production of any clinical evidence of mastitis.

(2) The lactating cow as judged by the intradermal tuberculin test had cleansed itself of infection within 107 days whereas the non-lactating animal gave a positive response to avian and bovine tuberculosis when tested 107, 215 and 314 days following artificial infection. The response was much more marked with the avian or homologous product than with the bovine or heterologous product.

(3) Biological tests of individual udder quarter secretion samples during life failed to demonstrate infection with the tubercle bacillus in any quarter other than the inoculated one.

(4) *Post-mortem* examination of the infected cow 440 days after experimental infection revealed no macroscopic evidence of tuberculosis of the udder or of any other organ.

(5) Tubercle bacilli possessing avian cultural characters were demonstrated by biological test to be present in the colostrum of the inoculated udder quarter of the cow at the time of slaughter, the remaining colostrum samples and retromammary lymph nodes proving negative.

(6) It was also shown that the passaged organism still retained its pathogenicity for the fowl.

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THE POTENCY OF TUBERCULIN

DISCUSSION BY SOUTH-EASTERN DIVISION

[In our issue of December 24th, 1938 (*Vet. Record.* **50. 52. 1759-1772**) we published a paper entitled, "The Potency of Synthetic Medium Tuberculin for Use in the Double Intradermal Test in Cattle," by Dr. R. F. Montgomerie and Mr. A. Thomson, of the Wellcome Physiological Research Laboratories, which formed the basis of addresses given to the Western Counties Division, N.V.M.A., at Taunton, on October 26th, 1938, and the South-Eastern Division, N.V.M.A., at Tunbridge Wells, on November 18th, 1938. Below we reproduce a report of the discussion on the address, given by Dr. Montgomerie, to the South-Eastern Division.]

Mr. W. P. Blount said he was particularly pleased that the results of this work had been reported to the Division for he believed that they were a good indication of the existing state of affairs and almost proved that the scheme based on the testing with Camden Town tuberculin would have to be revised and more sensitive material used. Dr. Montgomerie's work had shown very conclusively that the tuberculin in common use in this country was of relatively low potency. The tables had clearly demonstrated the advantages of testing with stronger material and he would wish to draw attention to the regularity with which the Langley Court tuberculin in infected cattle had given a clear-cut positive result, or one showing some oedema at the 48th hour, thus rendering reinjection unnecessary. They were aware no doubt that he had used a new synthetic tuberculin "E" supplied by Messrs. Bayer Products, Ltd., and had shown that it too was more potent than Camden Town tuberculin. In his case also the type of swelling on the negative animal was a little different from that to C.T. He would like to ask why the more sensitive tuberculin gave a reaction response in the liver abscess case, and to enquire if the negative finding in animals which had previously given a doubtful reaction was related possibly to the recovery of the animal during the interval between the tests. It had been noted that some of the animals which tended to react to L.C. tuberculin were affected with Johne's disease only and he wished to know if such animals would have reacted better to johnin.

Mr. Blount went on to point out that from the figures in the tables it seemed obvious that the size of the measurements alone was of no consequence. He assumed that Dr. Montgomerie had not considered pain when making his readings, but had relied entirely on the presence or absence of oedema. If this was so did he make certain whether the oedematous swelling was *below* the point of injection?

With regard to Dr. Montgomerie's remark on the technique of injecting; with the fold of skin held between the finger and thumb one could feel the tuberculin entering the thickness of the skin in 85 per cent. of cases, but in his experience in about 15 per cent. the tuberculin appeared to diffuse under the skin so that one did not really feel it. He would like to know if in the latter circumstances Dr. Montgomerie reinjected. He also desired to know whether Dr. Montgomerie had experienced large nodular swellings without pain or oedema when using the Camden Town tuberculin in supposedly negative cases, because in his experience these were sometimes rather difficult to interpret.

Captain F. C. Gillard asked if Dr. Montgomerie had used the Langley Court tuberculin in the caudal fold as well as in the neck, or had he confined his work to the double intradermal test. If the caudal fold test had been used he would like to know the result. He had not understood whether any biological or microscopical work had been done on the case which showed only a liver abscess on *post-mortem* examination.

Major L. P. Pugh believed that Dr. Montgomerie's work raised the very important question, which had almost been asked directly, as to whether practitioners would prefer the more potent tuberculin. He had little hesitation in answering in the affirmative, since he had some reason for believing that the reactions with it were more clear cut. Furthermore, there appeared to be some danger that the less potent material would sometimes leave infected animals in the herd and greater danger lurked in such a happening than in the occasional removal as a reactor of an animal which was not infected. He also wished to raise the question of the large nodule sometimes seen when testing with the usual tuberculin. It was a type of swelling very difficult to classify. He believed they had occurred more often with the recent batches and that the reason for their occurrence should be further investigated. He wished to ask Dr. Montgomerie if he believed there was such a thing as a really "doubtful" reaction and whether such reactions would continue to occur if the tuberculin was constantly of the same potency. Would one agree with the opinion apparently held in some quarters that doubtful reactions were really due to a lack of skill in the carrying out of the test?

Mr. J. W. Bruford said he had had the advantage of working with Dr. Montgomerie and his colleagues who had helped him in several directions and, particularly, by making available supplies of Langley Court tuberculin. He felt quite strongly that there was a real need for a more potent tuberculin and could quote instances in which, had he continued to use the ordinary material in attempting to eradicate the disease, he would have found himself in a hopeless position. Regarding technique, did Dr. Montgomerie use any method other than clipping in preparing the site, and why did he insist on holding the skin between the fingers when injecting?

Mr. Henry Taylor observed that he noticed that the Camden Town tuberculin was largely prepared from the B C G strain. He would like to ask if the culture was renewed from time to time. He related his experience of a herd of 170 animals which had consistently passed the test

(the Camden Town tuberculin being used) over a period of years and into which there were no introductions except an occasional bull. During this period there was not even one doubtful reaction and he was happy that the herd was clean. In another attested herd a cow was purchased and found to give a doubtful reaction to Camden Town tuberculin. This animal was isolated and when retested later it passed. She was admitted to the herd and passed two subsequent tests; then at a further test gave a doubtful reaction. She was slaughtered and on *post-mortem* examination only two small tuberculous lesions about the size of the end of a lead pencil were found in the throat. He wondered if this might be a case of avian tuberculosis, because on this estate some 7,000 pheasants were reared each year. There were no fowls.

Mr. R. C. U. Fisher said he had also recently had the opportunity of simultaneously testing with L.C. and with C.T. tuberculins. One of his herds had been tested over a long period and in November, 1937, he had reason to believe that it was clean. In January, 1938, three cows were introduced on a clean certificate and not retested until the general herd test at the end of February. Then there were twelve reactors, among which were the three introduced animals, besides three other cows which gave a doubtful reaction. Since then the herd had been tested at intervals of two months and on each occasion there were two or three further reactors. It was difficult to credit that all this spread of the disease had resulted from the introduction of three "certificated" animals which had subsequently reacted. One of his great difficulties now was the occurrence of doubtful reactions, and he wondered if the use of more potent material would detect animals of low sensitivity which might well be infective. This herd was again tested in October, 1938, with both L.C. and C.T. tuberculins. There were seven positive agreements and three disagreements which were negative to C.T. and positive to L.C. On retesting these three identical results were obtained. In another small "clean" herd he still had one or two reactors despite repeated testing with Camden Town tuberculin. He thought it probable that the more potent tuberculins would hasten the process of eradication.

Mr. H. Scott Dunn stated that he was not altogether satisfied with the synthetic medium tuberculin now generally used and thought better results were obtained with old tuberculin. He still considered the subcutaneous test more reliable but, of course, it meant sleepless nights and a considerable amount of extra work. He had found that cows reacted to the intradermal tuberculin test which were affected with Johne's disease and in which no tuberculosis could be found on *post-mortem* examination.

Mr. A. T. Crowther agreed with Mr. Scott Dunn that the intradermal test, using old tuberculin prepared by Messrs. Burroughs Wellcome & Co., had given very consistent results.

Mr. H. Gooch said he believed the U.S.A. tuberculin was prepared for a single injection test to be read at the 72nd hour, and presumed that the Langley Court material was prepared on the same lines. He would like to ask what effect a second dose, in these circumstances, would have on the test and to hear Dr. Montgomerie's views on the selectivity of the various tuberculins. Was the explanation that the tuberculin of high potency was more selective, and did these sensitive tuberculins pick out animals affected with Johne's disease more readily? He, too, wished to raise this question of the large negative swelling and to ask if it was known what actualy caused it.

The Reply

Dr. R. F. Montgomerie, in reply, said he was particularly pleased to have reviewed this work before the South-Eastern Division, since he had had the help of several members in the work he had discussed.

Mr. Blount had had experience in the use of a more sensitive tuberculin and would probably readily agree with the contention that there was real need to reopen the whole matter. He and several others had mentioned the occurrence of large nodular swellings when testing with Camden Town tuberculin. This type of swelling had been encountered only occasionally in their work and when there was no evidence of oedema they did feel that the character of the swelling placed it as negative. He was not prepared at the moment to offer any explanation of the occurrence of these disconcerting swellings. Several members had drawn attention to the case in which the only abnormality discovered on *post-mortem* examination was a liver abscess, and had asked for some explanation as to why this animal had reacted to L.C. tuberculin. Their work had failed to demonstrate tubercle bacilli in material from the abscess and it might be thought that the infection which produced this lesion had caused a general sensitisation and produced a non-specific reaction to the protein in the stronger tuberculin. The great difficulty in any *post-mortem* work was, however, to feel certain that a tiny tuberculous lesion had not been overlooked. Low sensitivity did occur in animals with a single tiny lesion and also in those which were grossly affected. This gross infection might well produce no clinical symptoms at a time when the animal was infective and it was for this reason, particularly, that they thought it wise to employ more potent material for the test. It was certainly unfortunate that they had not had the opportunity to test with johnin some of the cattle which had been slaughtered, for it seemed that there was a certain amount of cross-sensitisation between the various acid-fast organisms which might infect cattle.

He agreed that it was important to feel the tuberculin entering the deeper layers of the skin and he had only rarely failed to satisfy himself that a true intradermal injection had been made. Where that had happened his practice was to choose another site and reinject at it. He could not recall an occasion on which his repeat injection had been unsatisfactory. Personally, he had to admit that he could not readily judge whether heat and pain were regularly present in swellings which showed diffusion, and it was for that reason that he depended almost entirely on the character of the swelling as to oedema in deciding its classification.

Langley Court tuberculin had been used to a limited extent in the caudal fold test, but his address of that afternoon had been confined to the question of the potency at which tuberculin should be used in the double intradermal test, and he believed it would be confusing the issue if they introduced the question of alternative tests. He was interested to find that Major Pugh was quite ready to give preference to more potent tuberculin. He had said that if they were to wage a winning war against bovine tuberculosis it was essential that the tuberculin they used would certainly pick out all infected

animals, and this did seem to be the most profitable attitude. Major Pugh had also raised this difficulty of the very large hard swelling and it would seem from what had been said that the incidence of such a happening had increased somewhat of late. He seemed to suggest that there was some "official" attitude that the defining of a reaction as doubtful was indicative of inefficient testing. Surely that could hardly be so, for almost everyone who had had a wide experience of the test had met an occasional swelling which, despite the most careful use of all their senses, defied interpretation. They had had the advantage of hearing Mr. Bruford's experience in using the two tuberculins and from some of the records he had passed on to Langley Court it did seem that Mr. Bruford would have been left in a very awkward position had he been testing only with material of low potency. The technique they had used in their work for preparing the site was simply the close clipping of a relatively small area and it seemed unwise to prepare the site by the use of spirit or a disinfectant. Mr. Fisher had given the meeting the benefit of his experience and Mr. Scott Dunn had expressed some dissatisfaction with synthetic medium tuberculin. Dr. Montgomerie was satisfied that it was an improvement on old tuberculin for this test and thought it would be unwise to criticise synthetic medium tuberculin in sweeping terms, for surely the question of the potency at which it should be used must first be settled. The deficiencies of a tuberculin of low potency were most likely to be made obvious in an attempt to eradicate the disease, for in these circumstances one would expect occasional new reactors to keep cropping up and this, apparently, was what was happening in some of the cases quoted. One could expect even a low potency tuberculin to detect infected animals in a clean herd to which infection had accidentally been introduced. Then good reactions could be expected for sensitivity to tuberculin was often very high in the relatively recently infected animal.

THE VOLE IN THE STUDY OF TUBERCULOSIS

"In 1937 Wells reported in this journal* an investigation of tuberculosis in wild voles (*Microtus agrestis*)," says the *Lancet* (December 24th) and continues: "The animals, which had been trapped alive by the field service of the Bureau of Animal Population at Oxford, came from seven different stations in the British Isles, and 134 of them were found to have macroscopic tuberculous lesions in which acid-fast bacilli were demonstrated. Wells thought that this acid-fast bacillus was probably a *Mycobacterium tuberculosis*, but its taxonomic position had not been determined. He has now followed up his observations by an inquiry into the susceptibility of voles to human and bovine strains of tubercle bacilli,† using animals bred in captivity for some years. The human strain of tubercle bacillus, he says, produced demonstrable lesions one month after intraperitoneal injection with at least 1 mg. of culture, but the bovine strain caused extensive and progressive disease with much smaller amounts—sometimes as little as 0·00001 mg. He accordingly suggests that the vole may be employed for distinguishing the two strains; a test dose of 0·001 mg. of moist culture of tubercle bacilli injected intraperitoneally should without fail give the answer in a month. There is a considerable mortality from intercurrent diseases among voles kept in captivity, but with attention to details of diet and housing these might be overcome."

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HORMONES AND LACTATION

"A short time ago it appeared that the central problem of lactation had been solved and that a special hormone made by the anterior lobe of the pituitary gland was the stimulus essential for the initiation and maintenance of milk secretion," says the *Lancet* in a recent issue. "This hormone, to which the name prolactin has been given, happens to have the property of causing growth of the crop-gland of the pigeon, and this affords a convenient method of assay. On this basis standardised lactogenic extracts are available and have even come into clinical use in a limited way. Unfortunately, however, as was shown in a review by Folley last autumn,* the control of lactation is not as simple as it seemed, and there has been more and more evidence that comparatively pure preparations of prolactin may be less effective than crude anterior-lobe extracts in stimulating milk secretion. Folley and Young† have now confirmed this finding and have also investigated the effects of various extracts upon cows in declining lactation. Single injections of a crude saline extract of fresh saline extract of fresh anterior-pituitary gland, and of prolactin and thyrotropic preparations prepared at low temperature from fresh gland, always increased the yield of milk considerably for five or six days, and only slight changes were found in its composition. Prolactin prepared at room temperature from commercial acetone-desiccated anterior-lobe tissue had no influence upon the yield or composition of the milk when given in doses that were equivalent to those of the fresh-gland extract as judged by the pigeon crop-gland test. On the other hand the daily injection of very large doses of prolactin prepared from dried gland led to a substantial and prolonged increase in milk volume with certain minor changes in composition. Evidently prolactin—defined strictly as the anterior-pituitary secretion that stimulates growth of the pigeon crop-gland—is not the only lactogenic substance in the hypophysis and its effects on lactation are by no means parallel with its effects on the crop-gland. Folley and Young suggest that the lactogenic activities of the extracts they used were more or less paralleled by their glycotropic activities. A thyrotropic preparation from fresh pituitary gland was found to be lactogenic in the lactating cow although it did not stimulate the growth of the pigeon crop-gland, but comparable doses of similar preparations made from dried gland did not affect milk volume or composition. From the clinical standpoint these results are somewhat disappointing, for they mean that the most efficient lactogenic extracts have other actions, of which the most worrying, with the cruder saline preparations, is a tendency to anti-insulin effects. Very likely this would be of little consequence to dairy stock, and to encourage the agricultural interests Folley and Young show that the extra milk secreted under the influence of crude saline extracts of pituitary glands could be sold for about a third more than the cost of glands used. Moreover the processes of preparation could be simplified and cheapened so that on a large scale the margin of profit would be greater."

*Wells, A. G., *Lancet*, 1937, **1**, 1221.
†Wells, A. G., *Brit. J. exp. Path.*, October, 1938, P. 324.

*Folley, S. J., *Lancet*, 1938, **2**, 389.
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The Veterinary Record

February 25th, 1939.

The Tuberculin Test: Its Practical Application

THE article by Mr. W. D. Blanchard in this issue, following as it does the earlier one on a similar topic by Mr. R. C. G. Hancock, encourages us in our belief that there is in existence among practitioners a considerable body of opinion and knowledge still in process of evolution as to the best means of conducting the tuberculin test under the varying environment that is encountered in this work, as well as in the assessment of the result. Much material has been published in our columns for some years past on the tuberculin test, but the two articles mentioned above appear to us to break new ground, and that too in a constructive way, in that they suggest innovations in the apparatus commonly employed to carry out the test, to the end that greater precision may be gained in its execution and interpretation. It is probably fair to generalise and say that under the conditions obtaining in up-to-date modern cowsheds the tuberculin test can usually be carried out properly with the instruments as they are. It is, however, another story when the test has to be conducted in dimly-lit sheds, or with unbroken animals, and it is by suggestions such as that of Mr. Blanchard for securing young cattle that we feel that the practitioner can help to surmount the difficulties and facilitate the securing of accurate results despite such drawbacks.

Critical comment is being directed to the calipers used for measurement in the sense that despite the simplicity and cheapness of the current type, they might be made more easy to read, and that the measurement once obtained should be incapable of alteration until noted accurately in a good light. Both of these seem reasonable and indeed necessary desiderata under average conditions. As to the syringe employed, the volume is usually 1 or 2 c.c. Both sizes have their advocates. Undoubtedly the smaller is easier to handle, but the larger lessens the necessity for such frequent sterilisation. Regarding the needles, the length, diameter and mode of attachment to the body of the syringe should be standardised. Concerning the screw, taper, and bayonet fastenings of the needle, the consensus of opinion seems to favour the last named as being the least likely to leak under pressure of dose administration. The screw-on needle is the worst offender in this respect. The adjustment of the dose within close limits seems easily solved by the one turn per dose of the milled nut on the piston rod, and is advisable on the score both of accuracy and economy of material.

Finally, there is the means employed for the securing of the animal with safety to itself and the operator. Animals are secured in the cowshed by many different means, some convenient for the test, others adding to its difficulty. Again the unbroken animal has to be dealt with in various ways if the testing is to be both safe and sure. There must be a good deal of lore known to practitioners in these matters, either devised by themselves or learned from others, that could well be published to the advantage of us all. We feel certain that the Special Committee on Tuberculin Tests would welcome a full discussion in our columns on the technique of tuberculin testing.

As we read the signs of the times, it seems that changes in the potency of the product used are likely to take place for the better in the near future. It is indeed encouraging to observe that hand in hand with this there are indications of the strong desire of those who carry out the tests, that their technical equipment shall likewise undergo improvement and alteration under the guidance of common sense and experience.

MILK IN ITS NUTRITIONAL ASPECTS

The Division for the Social and International Relations of Science of the British Association is arranging a meeting, to be held in the University of Reading (by kind permission of the Vice-Chancellor) on Tuesday, March 28th, on the subject of "Milk in its Nutritional Aspects." The meeting will take place from 2.15 (provisionally) and the subjects proposed are: (1) Deficiencies in present-day diet, the total amount of milk needed, etc.; (2) health aspects; (3) implications of compulsory pasteurisation; (4) agricultural aspects of production, with special reference to increase of production; (5) distribution and cost, economic and social implications.

Allowance of time will be made for discussion.

In connection with the meeting a visit to the National Institute for Research in Dairying, at Shinfield, near Reading, is contemplated during the forenoon of March 28th.

Admission to the meeting will be free, by ticket, obtainable on application to the Secretary of the British Association, Burlington House, London, W.1.

* * * * *

The Goethe Medal for Art and Science has been awarded by the German Chancellor to Dr. Theodor Kitt, professor of veterinary pathology in the University of Munich.

CLINICAL COMMUNICATION

Successful Treatment of Severe Tetanus in a Shire Mare*

JOHN CANE, M.R.C.V.S.,
WREXHAM

SUBJECT.—A six-year-old Shire mare (in-foal) about 16·1 hands high. Eligible for Stud Book.

HISTORY.—On Saturday, October 29th, 1938, the owner reported that the mare was carting mangolds and was noticed to be slightly stiff. On Sunday morning she appeared to be stiffer, but nothing was done and the mare was left in the stable. On the following morning she was considerably worse, and the owner, becoming alarmed, reported the case and symptoms in the evening and asked for veterinary advice. The mare was seen that evening, October 31st.

EXAMINATION.—This showed dilated nostrils, quick breathing, a rigid stance with straddling hind limbs, tail straight out and trembling; the muscles of the thighs and loins and along the back to the shoulders and up the neck were very hard to the touch. There was sweating at the hind-quarters. When the head was handled or lifted, reflex of the membrana nictitans was shown half-way across the eye. The jaws could be opened to the extent of the breadth of two to three fingers. The mare when eating hay made a sucking noise. No wound of any sort could be found.

DIAGNOSIS.—Tetanus.

PROGNOSIS.—Very guarded and very little hope of recovery.

TREATMENT.—It was suggested that the mare should be left in her stall absolutely quiet and in the dark. No one but the person that fed her should go near her. To the owner, who was most anxious to do his best to save the mare, it was suggested that serum treatment should be tried and that if carried out it should be done thoroughly and without consideration as to cost. It was thought if the mare went down she would not get up again. The owner was informed of the expense likely to be entailed for extended treatment (from £12 or more according to how the animal responded to treatment). The owner said he would think over the suggestion and decide on the morrow, which he did, agreeing to serum treatment.

October 31st.—First attendance. Ordered tetanus antitoxin "Behring" (Bayer & Co.)

November 2nd (Wednesday).—Attendance. A few c.c. of serum were given subcutaneously to desensitise the mare before injecting the full dose (one hour and a half later). 60,000 units of serum was then injected intravenously in left jugular and 30,000 intramuscularly and subcutaneously. (30,000 International Units = 50 c.c.)

The membrane was flickering across the eye; the muscles of the withers and the top of the shoulders were tetanised, also the loins and thigh muscles. The tail was up, the neck stiff, and the hind legs were straddled.

November 3rd.—Injected 90,000 units intravenously into left jugular and 60,000 intramuscularly and subcutaneously.

The mare's appearance was about the same. The membrane passed across the eye on movement and she had a "stilty" gait behind. She was still eating.

November 4th.—Injected 150,000 units as day before—but into the right jugular.

The mare staggered as the last two syringefuls were injected and looked like falling. She appeared better but on turning towards the light showed signs of distress.

November 5th.—Injected 150,000 units, left saphena vein.

On this day she was not so stiff; in fact, she was free in head and neck movement. On the other hand, the membrana reflex appeared more pronounced. She was grinding her hay better.

November 6th (Sunday).—Injected 150,000 units, internal saphena, left hind limb.

November 7th.—Attendance. Improving.

November 10th.—Injected 60,000 units, right hind limb, saphena vein.

On this day the animal showed still further improvement. Her tail was still held straight out, but was no longer trembling. Membrana nictitans reflex not so pronounced. General appearance—more tranquil. Slight dilatation of nostrils. Hind limbs not so straddled. It was suggested that a loose box should be prepared for the mare and she moved in gently on the 11th.

November 15th.—Mare walking about loose box; membrana reflex not so pronounced nor tail so straight. Showed signs of "nagginess" when approached.

November 18th.—Going on nicely; membrana reflex still in evidence. Walking well round loose box.

November 24th.—Doing well. Walked out of box on yard for the first time. After this date she was given exercise daily.

December 4th.—My last attendance. Mare found to be practically right again. The only symptom was the faintest perception of the membrana reflex when suddenly lifting head.

A total of 750,000 units (1,250 c.c.) was given in this case, at a cost of approximately £14.

*Case presented to the North Wales Division, N.V.M.A., at a meeting held at Corwen, December 9th, 1938.

ANNOTATION

Cod Liver Oil and Animal Nutrition

Cod liver oil is used to a considerable extent in veterinary medicine both as a preventive and a cure of disease. It is also used extensively in the stock-raising industry as a constituent of the diet, being fed as a source of vitamins A and D, particularly for young growing animals and birds and for pregnant females. In human nutrition, where economic conditions do not impose limitations, the dietary is usually of such a varied character that troubles arising from dietary deficiencies are comparatively uncommon. In animal husbandry, however, cost is always a primary consideration. The stock owner naturally wishes to feed his animals as cheaply as possible and consequently where the animals are not running under completely satisfactory natural conditions but are being fed made-up diets there is a tendency to buy in the cheapest market and to omit constituents which do not seem to be necessary. Under these conditions, which still apply on many farms, troubles arising from restricted diets are not uncommon, particularly in the young or growing animal. Many disorders in pigs and poultry are due to nutritional deficiencies, particularly those associated with a lack of vitamins A and D. The practice of adding cod liver oil to animal feeds developed in an effort to overcome these troubles, usually with beneficial results. As the practice extended conflicting results were obtained and it seemed that in many cases little good accrued from this addition, while in some cases actual harm appeared to result. Gradually it was realised that the quality of the oil used was responsible for many of these variable results.

Some of the trouble was due to actual adulteration and some to the low quality of certain brands of cod liver oil upon the market arising from bad methods of preparation. Many oils marketed as cod liver oil, particularly when they were designated veterinary cod liver oil, or cod liver oil for stock feeding, actually contained varying proportions of other marine oils such as sperm oil, herring oil, shark oil, or dogfish oil, while some alleged cod liver oils even contained mineral oils. Until comparatively recently no cod liver oil was guaranteed both as regards purity and vitamin content.

Cod liver oil itself, especially when it is still in the liver, is not particularly stable; it deteriorates fairly rapidly and shows varying degrees of rancidity exhibited by darkening in colour, development of unpleasant taste and smell and increased acidity. A good cod liver oil should have a pale yellow colour, a bland not unpleasant taste and smell and a free fatty acid content of less than 0·6 per cent. Many of the oils used in adulteration have a high content of unsaponifiable matter and so from this point of view it is important that the unsaponifiable content of oil sold as cod liver oil should not exceed 1·5 per cent. From the medicinal point of view the content of the oil in vitamins A and D should be specified, and minimum values for a good oil are 1,000 International Units of vitamin A and 100 International Units of vitamin D per gramme.

When such an oil is used in feeding experiments its results are definitely beneficial, the doses required being of the order of one part cod liver oil per 100 parts of dry food for chickens and two parts oil per 100 parts of dry food for pigs. Owing to the instability of the oil when mixed with other matter it is advisable not to keep large quantities of food-oil mixtures. It is also advisable not to keep the oil exposed to light, air or oxygen for lengthy periods before use. The data given in the following tables serve as illustrations of the effects of cod liver oil of good quality when added to the dietary of poultry and pigs. The diets used would generally be considered to be good normal diets.

TABLE I

EFFECT OF FEEDING COD LIVER OIL* TO POULTRY

Potency—1,000 International Units Vitamin A. 100 International Units Vitamin D.

	Feeding Level of C.L.O.	Period of Test.	Average Weight in Ounces.		
			Without C.L.O.	With C.L.O.	Difference.
	Per cent.	Weeks.			
Chicks	2	5½	9	16	7
†Turkeys	2	5	7	31·8	24·8
Ducks	1½	3½	16	42	26

*The cold liver oil used in the experiments reported in these tables was Sol-Vit-Ax.

†At the end of fifth week only one bird was alive of the controls without cod liver oil.

TABLE II

RATE OF LIVE WEIGHT GAIN IN PIGS KEPT ON DIETS WITH WITH AND WITHOUT ADDITION OF COD LIVER OIL.

C.L.O. added to diet.	Weight of Litter at 8 Weeks.	Live Weight Gain in Ounces per Day over the following Periods of Growth of the pigs.		
		Weight less than 100 lbs.	Weight between 100-150 lbs.	Weight between 150-190 lbs.
None	24 lbs.	14	13	9
1 pint per cwt. live weight	32 lbs. 1 oz.	16	20	23

TABLE III

REARING RECORD OF PIGS KEPT ON DIETS WITH AND WITHOUT ADDITION OF COD LIVER OIL

Cod Liver Oil.	Season.	Number of Litters.	Number of Pigs Born.	Number Weaned.	Number Reaching Maturity.
None	Winter	3	24	10	None
	Summer	3	36	30	3
½%–2%	Winter	3	29	22	20
	Summer	3	31	22	20

The results given in these tables, although not properly analysed statistically, clearly indicate the advantages to be gained in the rate of growth of pigs and poultry and in the rearing record obtained with pigs fed on diets containing additions of cod liver oil. With pigs the general quality of the carcase is also improved and its suitability for bacon is increased. Objections have been raised to the feeding of cod liver oil to bacon pigs on account of its alleged effect upon flavour, and upon the development of rancidity in bacon after curing, but no objection can be raised if the use of the oil is discontinued a short time before slaughter. There is some evidence to suggest that the oil does not impart any flavour to the bacon if it is a pure good quality oil, even when the additions to the diet are made right up to the time of slaughter. Although no statistically sound experimental observations have been recorded upon the effect of additions of cod liver oil to the rations of cattle, horses and dogs, yet there appears to be some evidence from practical experience that such additions are truly advantageous, particularly during winter, in increasing the resistance of an animal to the onset of infectious diseases, *e.g.*, strangles.

Of late years veterinary surgeons and stock owners have been chary of feeding large quantities of cod liver oil—as a source of fat—because of statements to the effect that deleterious sequelae are to be expected. Reports from abroad ascribe toxic effects to some brands of cod liver oil. Recent work, however, using pure, good quality cod liver oil, shows that as much as 10 per cent. of the oil may be fed without ill effect and rather suggests that the deleterious results previously reported were obtained with impure cod liver oil, perhaps even containing large amounts of mineral oil.

It becomes clear, then, that the veterinary profession can only recommend the feeding of cod liver oil of guaranteed purity, low fatty acid content and containing specified amounts of vitamins A and D. Fortunately there are now several firms who market such guaranteed genuine oil, which can only be produced provided the greatest care is exercised throughout its manufacture.

The conditions necessary to safeguard the manufacture of a high quality genuine oil can best be illustrated by describing what happens at probably the largest centre for cod liver oil production in the world. At Hull* the manufacture is entirely in the hands of the fishing industry. The modern trawler, besides being built to travel long distances, is equipped with apparatus for rendering the oil at sea by boiling the cod livers immediately the trawl is hauled and in this way the inclusion of deleterious products arising from decomposing livers is avoided. The fresh oil is decanted off from the boiler and stowed in suitable containers until the trawler reaches port.

HULL TRAWLER FLEET: Carrying aft the livers from the freshly gutted cod to be boiled immediately.

In order to keep the fish and the oil fresh on board large quantities of ice are produced in the industry's own factory, where it is broken up into pieces about the size of a walnut and automatically loaded into the vessels. At Hull 250,000 tons of ice is produced in a year.

On arrival in port each consignment of oil is transferred to a tank wagon, taken to the laboratory and tested for quality. As the livers have always been the perquisite of the fishermen the latter receive additional payment for the oil according to its quality. In order to

*Certain members of the veterinary profession were recently afforded the opportunity of joining a party which visited the dock, refinery, ice factory and biological laboratories of the British Cod Liver Oil Producers (Hull), Ltd., and were thus enabled to see at first hand the processes of manufacture as carried out by this pioneer firm in the production of pure, good quality cod liver oil of specified vitamin content.

safeguard the purity of the oil produced on board the fishermen are also paid for the whole livers of any other fish caught, such as haddock, saithe, halibut, plaice, lemon sole, etc.

From the dock the oil is transferred to a modern factory, designed to facilitate the maintenance of rigid cleanliness, on the outskirts of Hull. Here it is filled into huge pre-separator storage tanks, from which it flows by gravity to the separators, where it is cleaned by centrifugation, all traces of moisture and tissue being removed, after which cleaning the oil is passed on to storage tanks. This is the stage at which the oil destined for veterinary and stock purposes is run off as required into its final containers after chemical and biological tests have been made of its purity and vitamin content.

The veterinary oil contains a fair quantity of stearine, a fat which readily solidifies and gives it a turbid appearance in cold weather. For the purposes of human medicine the stearine is removed by filtering the oil after it has been cooled to a low temperature. Stearine, which has considerable food value as a fat, does not lower the value of the veterinary cod liver oil and it is only abstracted from the oil destined for human purposes for reasons of appearance and convenience. The clear oil obtained in this way is filled into its containers ready for dispatch and is labelled with the firm's guarantee of purity and content in vitamins A and D..

The whole of the procedure referred to above is controlled by laboratory tests at different stages and the vitamin content is estimated both spectrophotometrically and by rat and chicken tests; a necessary duplication, as it has been found that some of the forms of vitamin D, especially the synthetic variety, do not have the same antirachitogenic value for growing chickens as does that present in cod liver oil.

An interesting development in the use of cod liver oil which is giving encouraging results is its employment either alone, or as an ointment base, for application to damaged epithelial surfaces. Its protective value after extensive burns have destroyed superficial tissues is considerable, while it has a definite stimulating effect upon healing; the proliferation of epithelial cells appears to be stimulated to a greater extent than are fibroblasts, and in consequence the final scar is of smaller size.

In conclusion it may be mentioned that in the last few years the amount of cod liver oil used for stock feeding in this country has risen from a negligible quantity to about one-and-a-half million gallons per annum.

W. R. Wooldridge.

ABSTRACTS

[The Anti-Gas Protection and Treatment of Gas Casualties amongst Animals. Richters, Dr., Chief Veterinary Officer, Army Research Department, Berlin. Paper to Thirteenth Int. Vet. Cong.]

The author regards chemical warfare as a new applied science built up on a series of auxiliary sciences: chemistry, physics, biology, physiology, meteorology, topography and geology. Although the new science has reached a high level of development, chemical warfare continues to be burdened with a number of uncertain factors and he quotes that it confronts us on every hand with the unknown, the undeterminable, the inconstant and the incalculable.

In discussing protection generally he concludes that effective protection can only be afforded by personal (individual) protective equipment. All States interested in war have studied the question of developing effective anti-gas apparatus for horses, dogs, and carrier pigeons. In the last war animal respirators were made whereby inspiration and expiration (one-way respiration) were both effected through layers of cloth impregnated with various chemicals, *i.e.*, a humid filter. The objections to this type are that it has a short service life and does not protect against all war gases. It tends to dry out in summer and in hard frost to congeal so as to make breathing difficult or even impossible. The only successful respirator is one fitted with a dry interchangeable filter containing activated carbon (charcoal) and inspiration and expiration valves (two-way respiration). Such filters are ineffective against particles of war substances in suspension (arsenical smokes) but cotton or other fibres are effective against these substances (particulate protection). Charcoal acts in three ways: (1) as an adsorbent, (2) as a disintegrator (hydrolyser), and (3) as a cataliser. Ordinary charcoal filters do not protect against carbon monoxide. A modern horse respirator should be made of strong, light tissue; it should be easily and quickly put on, should not interfere with the reins and must protect against *all* war gases. The life of the filter inset is short; it is not dependent on the duration of use but on the degree of concentration of the war gas. At very high concentrations the filter may be penetrated at once. Discussing the resistance to breathing of such a device, the author stresses the importance of training; he estimates the consumption of respiratory air to be 500 litres per minute for horses doing very heavy draught work and states that the resistance at this flow rate should not exceed 140 to 160 mm. water column. Protection is also

required for the eyes and the lower portion of the limbs though the latter problem is described as difficult whilst it is an easy matter to devise a general body cover of gas-proof tissue. As regards mules, the same considerations apply as to horses and for donkeys and oxen a humid filter respirator "might be made to do." The development of efficient dog respirators is difficult in view of the variety of sizes required to fit the different sizes and shapes of heads. For carrier pigeons a portable gas-proof case to carry four birds is recommended.

As regards the collective protection of animals, preference should be given to covered heights when siting stables, hospitals, etc. Gas traps such as thickets, cuttings, hollows and valleys should be avoided, also crossroads, strategic points and traffic centres. Stables and byres should be rendered gas proof.

As to the treatment of animal gas casualties, the author estimates the sensitivity of horses to mustard gas to be five to six times as high as that of man and notes that they possess insensitivity to only one group of war gases, namely, the lachrymators. For suffocants (type phosgene) the principles of treatment are fresh air, avoidance of all effort, and warmth. Oxygen is recommended either by inhalation or subcutaneous injection, drastic bleeding for the mechanical relief of the circulatory system, cardiac tonics, infusion of gum solution (6 per cent. in normal saline). Intravenous injections of calzimagon and later 20 per cent. grape sugar solution are used to combat pulmonary oedema. For mustard gas injuries general decontamination with weak chloride of lime solutions, soap and soda, and thorough rinsing with water are recommended. Solvents such as carbon tetrachloride should only be used where there is a shortage of oxidisers. For treatment, soapy, weak sulpholiquid or dakin solutions applied by bathing, cloths or bandages; vaseline at night; sun ray treatment by the quartz lamp in the later stages, together with protein and colloid therapy. Eyes should be continuously irrigated with water or physiological salt solution. To allay pain novocaine and adrenalin are used. Cocaine is contra-indicated. Atropine is employed when the anterior chamber is involved. For the respiratory passages, soda bicarb. solution for the nostrils, weak adrenalin solution (by dabbing), finely pulverised mucous stimulants for the upper, potassium iodide for the lower respiratory tract. Pneumonia should be treated with repeated injections of albumen ("artfremde Eiweiss"). Tracheotomy for laryngeal stenosis. For the digestive tract, mouth washes, local treatment of affected parts, soft diet, occasional fasting, forcible feeding if required, and gruel and animal charcoal for the intestinal tract.

As regards the arsenical smokes, treatment should be in accordance with the symptoms. Purgatives, milk, animal charcoal and gruel are suggested following ingestion of food or water contaminated with this poison. For other deleterious substances such as carbon monoxide, he recommends oxygen and CO_2, lobeline, bleeding and blood transfusion; for hydrocyanic acid, cardiacs and 0·8 per cent. solution of sodium thiosulphate, 200 to 300 c.c. for large animals, 20 to 30 c.c. for small animals given intravenously. Screening smokes are harmless but splashes of sulphur trioxide and chlorsulphonic acid should be carefully removed with a dry rag or covered with dirt, sand, etc., and then washed off.

R. M. B.

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[Influenza. (Prevention of Animal Diseases under War-time Conditions). Todd, A. G., and Soutar, J. J. M. (1938.) Paper to Thirteenth Int. Vet. Cong.]

The authors state that losses and inconveniences, direct and indirect, from this disease assumed formidable proportions on occasions during the Great War and, owing to the lack of exact knowledge of the cause and diagnosis, consider that, unlike glanders and mange, it may be regarded as of great potential danger to military animals in future operations.

A filterable virus found in the saliva and body fluids is accepted as the causal agent and they contend that it remains in the body for an indefinite period. The result of inoculating 700 young susceptible horses in Holland with virulent blood under favourable conditions was as follows:—

25 per cent. developed pyrexia.

40 per cent. developed pyrexia and anorexia.

16 per cent. developed pyrexia and anorexia and oedema of limbs.

6 per cent. developed pyrexia and anorexia and oedema of limbs and conjunctivitis.

5 per cent. developed pyrexia and oedema of limbs.

5 per cent. developed pyrexia and conjunctivitis.

3 per cent. developed all the above symptoms plus cough and diarrhoea.

This is considered to be a true picture of the disease in its uncomplicated state, and when these animals subsequently joined their Army units the incidence of pneumonia among them when compared with uninoculated remounts, was strikingly reduced. The authors then describe outbreaks of the disease in Egypt, North America and India to illustrate what may happen from natural infection in unfavourable circumstances.

In Egypt in 1916 Australian remounts developed the disease in a depôt. Of the 3,900 horses and mules, 3,221 (86 per cent.) contracted the disease, of which 561 (14 per cent.) had severe catarrhal *or* pneumonic complications. The mildest cases took six weeks before being fit for issue. In 1918 in North America a severe outbreak occurred amongst remounts sent from collecting centres in the West to the Eastern depôts for shipment. In India, in 1915, when control suffered from a shortage of veterinary officers, the disease appeared in Calcutta amongst Australian remounts in April but not before animals in the infectious stage had been redrafted to other depôts and units. By September 16,921 cases had been reported as follows:—

	No. of cases	*Mortality*	*% of admissions*
Horses	16,045	886	5·5
Mules	804	5	0·6
Donkeys	72	2	2·8

Sequelae were laminitis, iritis, arthritis, tendonitis, shedding of the hoof, abortion, retained placenta in mares of the breeding depôts, chronic debility and roaring. In another outbreak in India in 1930, 9,786 animals contracted the disease with a mortality of: horses, 0·2 per cent.; mules, 0·1 per cent.; and donkeys, 28·0 per cent. By examining case records over a number of years it was ascertained that the period of immunity conferred by an attack was approximately four years.

Measures for control are:—

1. All horses confined to unit lines.
2. Unit placed out of bounds and no animals, civil *or* military, allowed within a mile radius.
3. Temperatures of all animals taken daily.
4. Segregation of the worst cases.
5. Disinfection of grooming kit.
6. Isolation of remounts.
7. All work in the unit stopped.
8. Daily inspection.
9. Use of stable rubbers discontinued.
10. Excreta burned.
11. Anti-fly measures.

The authors conclude that catarrhal and pneumonic complications are due to secondary invasion; that virulence is influenced by local conditions and the type of animal infected; that change of environment, journeys by train and sea, and work during the incubative stage favour its spread and the development of untoward sequelae; that remounts should be segregated for three weeks and temperatures taken daily; that paddock accommodation is more favourable than housing in stables.

R. M. B.

[The Treatment of Contagious Granular Vaginitis by Gaseous Dilatation. (Trans. title.) Groulade, P. (1938.) *Rec. Méd. vét.* **114.** 7. 404-410.]

This disease is usually found only in the female but is sometimes met with in the male, both in the bovine and ovine species. Apparently it is extremely common in France.

Various causal organisms have been blamed but the condition is now found to be due to a streptococcus.

The chief difficulty found in treating the disease is due to the situation of the organisms deep in the inflamed epithelium. Of various methods tried the objection has always been the length of time the animal has to undergo treatment.

Maisler suggested treatment by dilatation of the vagina by gas and this method has been tried out by the author in 40 cases. The vagina is dilated by the introduction of hydrogen peroxide with the addition of colloidal silver protein which causes the liberation of pure oxygen and the penetration of silver into the infected mucous membrane. The fluids are introduced by means of a special sound.

The physical and chemical reactions taking place are carefully explained.

Forty cases were treated, 38 chronic and two acute, and 34 cures were made. In chronic cases it was noticed, however, that the granulations rarely disappeared at once and on two occasions the disappearance was noted only after six and seven months. Although the granulations may not have disappeared, the subject becomes fertile after treatment.

B. B.-J.

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[Enzoötic Pneumonia in Sheep. Montgomerie, R. F., Bosworth, J. T., and Glover, R. E. (1938.) *J. comp. Path.* **51.** 2. 87.]

This article records the results of an investigation into outbreaks of pneumonia in sheep which occurred mainly in North Wales though a few cases occurred in East Anglia. The disease showed a fairly regular seasonal incidence in Wales, occurring usually in the spring or late autumn. It was often possible to associate some sudden change in climatic conditions or some crowding together of the sheep with the appearance of the disease in Wales though these features were not well marked in other areas. The disease was usually confined to mature animals in Wales but in the outbreaks in East Anglia lambs were occasionally involved. Usually the first indication of the disease was excessive coughing when the flock was rounded up. Closer examination of obviously affected sheep showed a mucoid nasal discharge but the characteristic feature was spasms of convulsive coughing. In the early

stages there was little elevation of temperature but animals affected for any length of time tended to separate from the rest and showed a dryness of coat and loss of condition. Advanced cases had usually a high temperature and showed obvious signs of respiratory distress accompanied by copious nasal and often slight ocular discharge. The duration of the disease varied from twelve hours to seven days. Apparently a considerable number recovered, for the actual death rate was rarely above 15 per cent. although in many flocks it seemed as if every sheep were affected.

Post-mortem examination showed lesions of broncho-pneumonia in one or both lungs. Acute cases showed marked bronchitis and extensive pulmonary congestion with excessive pleural fluid and petechial haemorrhages on the pleura and pericardium. In more chronic cases small areas of the lungs had a mottled appearance owing to the presence of red and grey hepatisation. There was also fibrinous pleurisy. Parasitic invasion of the lung tissue occurred in some affected flocks but not in others, and there was no evidence that the larvae of *Oestrus ovis* played any significant part in the aetiology of the disease. Bacteriological examination of 18 cases in North Wales revealed the presence of a Pasteurella-like organism which was most plentiful in chronic cases. Each of the outbreaks in other areas yielded an identical organism. An attempt was made to determine the pathogenicity of cultures from affected sheep for laboratory animals and for sheep by various routes, but even when freshly isolated they seemed to be devoid of pathogenicity unless for mice. On the other hand, direct intrapulmonary inoculation of unfiltered suspensions from affected lungs induced the formation of pulmonary lesions dissimilar from those in the naturally occurring disease.

No direct evidence was obtained as to the transmission from diseased to healthy animals in affected flocks although in some cases it seemed that the introduction of an affected animal had initiated an outbreak. It is suggested that the Pasteurella-like organism isolated is largely responsible for the severe terminal pneumonia but that it requires some initial stimulus such as sudden environmental changes.

A. R.

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[Experimental Infection of Young Dogs with S. enteritidis var. Dublin. (Trans. title.) Dorssen. (1937.) *Zschr. Veterinärk.* **49.** 12. 419-423.]

Three fox terrier puppies six weeks old, showing no cultural or serological evidence of salmonella infection, were starved for 24 hours. They were then given 10 c.c. of ol. ricini *per os* and 4 c.c. of ox bile subcutaneously. After a further 24 hours' starvation they received another 4 c.c. of bile subcutaneously and 4 c.c. *per os*. One hour later they received 25 c.c. of broth of culture of *S. enteritidis* together with three pieces of meat soaked for 24 hours in a broth culture of the organism. One hour later they received their normal food.

A slight illness followed and the bacteria could be recovered from the faeces for five days. After the five days agglutinins to the organism could be found in the blood and these persisted till the 23rd day when the animals were killed. *Salmonella enteritidis* was recovered only from the mesenteric lymph glands.

P. S. W.

REPORT

[Milk and Nutrition: Part III.—The Effect of Commercial Pasteurisation on the Nutritive Value of Milk as determined by Experiments on Calves.]

The feeding experiments recorded in this report were carried out at the National Institute for Research in Dairying at Reading and with minor differences, duplicated at the Rowett Institute, Aberdeen.

Both the raw and the pasteurised milk received by the calves came from the same bulked commercial sample. The animals were allowed to suckle their mothers for three days and on the fourth came under experiment. Records were taken over a period of approximately six months.

In neither of the experiments was there any significant difference in the amount of food consumed in the two groups, in the live weight of the animals, in the average body measurements or in the chemical analyses of the blood.

The conclusions can be summed up in the words of the report, that: "If there were any slight differences in the two groups these were so small as to be masked by the conditions of the experiment."

N. S. B.

NATIONAL PONY SHOW

The show committee of the National Pony Society reports that the total number of entries for the Society's show, which will be held at the Royal Agricultural Hall, Islington, on March 3rd and 4th, is 243, compared with 198 last year. The council of the Society has been informed that the Royal Agricultural Society has decided to include in the prize schedule for its **Windsor** show this year five new classes for Mountain and Moorland ponies—Dales and Fell (competing together), Exmoor and New Forest (competing together), Highland, Welsh, and Dartmoor. The section for polo and riding ponies will be augmented to include a new open class for English-bred polo riding ponies.

ROYAL COLLEGE OF VETERINARY SURGEONS

Special Meeting of Council

THE LOVEDAY REPORT

A Special Meeting of Council, R.C.V.S., was held at the College, 10, Red Lion Square, London, W.C.1, on Wednesday, January 11th, 1939.

Mr. G. H. Livesey (President) occupied the Chair, and there were also present Lieut-Col. J. W. Brittlebank, Professors J. B. Buxton, J. F. Craig, T. Dalling, Messrs. H. W. Dawes, P. F. Dolan, Major G. W. Dunkin, Messrs. R. E. Glover, J. Holroyd, Major Hamilton Kirk, Messrs. G. H. Locke, J. W. McIntosh, G. P. Male, Major A. B. Mattinson, Captain T. M. Mitchell, Lieut.-Col. W. S. Mulvey, Mr. W. Nairn, Captain J. W. Procter, Dr. J. Share Jones, Lieut.-Col. P. J. Simpson, Captain R. Simpson, Mr. Arnold Spicer, Colonel G. K. Walker, Mr. T. Wilson and Professor G. H. Wooldridge.

The minutes of the previous Special Meeting of Council, having been printed and circulated, were taken as read and signed as correct.

Correspondence.—(*a*) A letter was received from the Ministry of Agriculture asking for the views of the Council on the main recommendations of the Report of the Committee of Inquiry into Veterinary Education.

It was resolved, "That an interim reply be sent explaining that the Council had not yet completed its discussion of the Report, the drafting of the letter to be left in the hands of the President and Secretary."*

(*b*) A letter was received from the Secretary of the National Veterinary Medical Association, transmitting a copy of a Resolution passed by the Council on January 3rd, which had also been communicated to the Ministry of Agriculture.

It was resolved, "That the letter be acknowledged."

(*c*) Letters were also received from the Principal of the Royal (Dick) Veterinary College, the Principal and Secretary of the Glasgow Veterinary College, and the Principal of the Veterinary College of Ireland. These were considered in connection with the subject of the following paragraph.

Consideration of Report.—An amended memorandum on the Report prepared by the President and Secretary was then considered in detail and a number of amendments made to it.

Owing to the lateness of the hour, it was then resolved, "That the meeting be adjourned until Thursday afternoon, January 12th, 1939, at 4 p.m."

. . . . .

At the *Adjourned* Special Meeting of Council, held at the College, 10, Red Lion Square, London, W.C.1, on Thursday, January 12th, 1939, there were present: Mr. G. H. Livesey (President) in the Chair, Lieut.-Col. J. W. Brittlebank, Professors J. B. Buxton, J. F. Craig, Messrs. R. E. Glover, J. Holroyd, G. H. Locke, J. W. McIntosh, G. P. Male, Major A. B. Mattinson, Captain T. M. Mitchell, Lieut.-Col. W. S. Mulvey, Mr. W. Nairn, Captain J. W. Procter, Dr. J. Share Jones, Captain R. Simpson, Mr. Arnold Spicer, Mr. J. F. D. Tutt, Colonel G. K. Walker, Mr. T. Wilson and Professor G. H. Wooldridge.

Consideration of Report.—The Report of the Loveday Committee and the draft memorandum were further considered. Approval was given to the latter part of the memorandum, and the Secretary was instructed in consultation with the President to redraft it with the alterations made.

The consideration of the Report was then deferred pending the receipt of further communications from the affiliated Colleges.

*This letter received publication in our last issue.—*Editor.*

FOOT-AND-MOUTH DISEASE

Agricultural Support for the Slaughter Policy

"That the policy of slaughtering beasts affected by foot-and-mouth disease is justified, was demonstrated by figures which were produced at the meeting of Bedfordshire Agricultural Committee on Wednesday," says the *Bedfordshire Standard* of February 10th. "It was shown that whereas during the six months from April to September last year there were only 49 outbreaks of the disease in Great Britain, there were, for instance, 66,600 infected premises in Germany in the month of September alone. Other figures for Continental countries for the month of September included Czechoslovakia, 79,460; Poland, 66,315; and France, 30,184.

"The statistics were contained in a letter from the Council of the Royal Agricultural Society of England, which stated that the increase of the disease on the Continent must mean a comparable increase of the risk of infection in this country, and it was urged that the police should be reminded of the importance of all movement of cattle, sheep and pigs being registered punctually and accurately by stock-owners and dealers, as required under the Movement of Animals Order, so that in the event of an outbreak all contacts might be traced without delay. It was also suggested that the police would be performing a further useful act if, when checking registers, they urged that the smallest suspicion of the presence of the disease should be reported at once.

"Mr. B. Hartop said this county had escaped the disease so far this year, but the time was approaching when there would be considerable movement of cattle, and it was a wise move to call attention to the necessity of registering punctually. The small figure for Great Britain as compared with the Continental countries showed that the policy of slaughtering was justified."

N.V.M.A. DIVISIONAL REPORTS

North Wales V.M.A.*

MEETING AT CORWEN

A meeting of the North Wales Division, N.V.M.A, was held at the Owen Glyndwr Hotel, Corwen, on Friday, December 9th, 1938.

The President, Mr. H. Llewelyn Jones, occupied the Chair, and there were also present Messrs. Beynon, Bowen, Cane, Cartwright, Professor Craig, Messrs, W. Hughes, W. Jones, W. O. Jones, Lewis, W. T. Rowlands, Professor Share Jones and Mr. H. V. Hughes (Hon. Secretary).

Apologies for absence were received from Messrs. Brownlie, McCutcheon, Manley, Millington, Richards, Salusbury, Savage, J. Ll. Williams and R. Wynne Williams.

The minutes of the meeting of August 12th, 1938, were read and confirmed.

The Hon. Secretary, on behalf of the members present, congratulated the President on his recovery from illness. Mr. W. Hughes was also welcomed back following his recent operation.

The question of whether members of the profession who were not members of the N.V.M.A. should be entitled to become members of the Division was considered, but it was agreed to defer further consideration of the matter until the next meeting.

Letters were read: (1) From the Royal Sanitary Institute inviting the Division to appoint a delegate to the Scarborough Congress. It was agreed to invite Professor Share Jones to represent the Division at this Congress should he be attending in another capacity.

(2) From the N.V.M.A., relating to the report of the Poultry Technical Committee. It was agreed that the Secretary circularise members of the Division drawing their attention to the article referring to the subject, published in the *Veterinary Record* of November 5th, 1938, and to enquire whether they are desirous that a course on poultry disease should be instituted by the Division.

Having been nominated at the previous meeting by Mr. J. H. Wynne and Mr. H. V. Hughes, the following gentlemen were unanimously elected to Fellowship of the Division: Messrs. W. M. Brownlie, K. A. Forker, J. A. McCutcheon, J. Richards, L. F. Robertson and G. H. Thomas.

The Secretary then called upon the Hon. Treasurer to present his statement. This showed a credit balance, and the Hon. Treasurer was congratulated upon the sound financial position of the Division. It was agreed that Mr. Cartwright be requested to prepare a statement of arrears of subscriptions for consideration by the Council immediately prior to the next meeting of the Division.

Election of Officers

Mr. Llewelyn Jones expressed his desire to be relieved of the office of President in view of the number of years he had held the appointment. Members, however, spoke of Mr. Llewelyn Jones's unremitting services on behalf of the Division and the desirability that, owing to the special conditions in which the profession finds itself, he should allow them to nominate him to the presidency for a further period. Mr. Llewelyn Jones, having expressed his willingness to accede to the wishes of the meeting, was unanimously re-elected President.

It was also agreed that a hearty vote of thanks be accorded to Mr. Llewelyn Jones for his valuable work on behalf of the Division in the past.

Other officers appointed were:—

Vice-Presidents.—Messrs. W. Hughes and G. J. Roberts.

Hon. Treasurer.—Mr. C. W. Cartwright.

Hon. Secretary.—Mr. H. V. Hughes.

Other Members of Council.—Messrs. W. O. Jones and W. T. Rowlands.

Auditors.—Messrs. W. T. Rowlands and W. H. Savage.

The meeting then considered a number of clinical cases and exhibits, which were presented by Messrs. Cane, Cartwright, Professor Craig, Messrs. Lewis and W. Jones. An interesting and stimulating discussion ensued and Professor Share Jones proposed and the Hon. Secretary seconded, a vote of thanks to these gentlemen for their valuable contributions, this being passed with acclamation.

[Mr. Cane's case, "Successful Treatment of Severe Tetanus in a Shire Mare," is recorded in the Clinical Section of this issue.—*Editor.*]

By the kind invitation of the President the members then partook of tea together.

H. V. Hughes, *Hon. Secretary.*

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North of Ireland V.M.A.*

ANNUAL MEETING AT BELFAST

The Annual General Meeting of the above Association was held in the Imperial Hotel, Belfast, on January 20th, 1939, at 7 p.m. Prior to the meeting the members were entertained to tea.

In the absence of the President (Mr. Kelly), Mr. Gilmore, the immediate past President,

*Received for publication January 23rd, 1939.

*Received for publication January 30th, 1939

occupied the Chair and the following members were present: Messrs. Barclay, Campbell, Cassells, Clarke, Corbett, Foggie, Green, Harper, Henry, Hobson, Jones, Keatinge, Kellett, Kernohan, Lamont, McAllan, Macnab, Morrow, Ranson, Russell, Shanks, Sim, Stuart, Wallace, Whyte and Williamson. Messrs. Harshaw and Christie were present as visitors.

The minutes of a Council meeting were read and adopted as were the minutes of the previous meeting which had been published in the *Veterinary Record*.

Arising from the minutes, the Secretary read a letter from Dr. Allen in connection with A.R.P. work in Northern Ireland in which it was stated that courses of lectures were now being given to the medical, dental and veterinary professions. A letter was also read from the General Secretary of the N.V.M.A. in reply to a query regarding the sale of a certain product to lay persons and its re-sale to farmers in Northern Ireland.

Apologies for inability to attend were received from Messrs. Magowan, Kerr, Macnab, Finch and W. S. Lamont.

Messrs. Christie, O'Neill and McKelvey, having been duly nominated at the previous meeting, were now proposed for election as members and unanimously elected, and the following gentlemen were formally proposed and seconded: Messrs. Hall (Ballyclare) and Harshaw (Banbridge).

Treasurer's Report.—In the absence of Mr. Kelly, the Treasurer, the Secretary read the Treasurer's report which showed a substantial credit balance. The report was unanimously adopted.

ELECTION OF OFFICERS

President.—J. W. Morrow.
Sen. Vice-President.—*J. I. Magowan.*
Hon. Treasurer.—H. C. I. Kelly.
Hon. Secretary.—P. L. Shanks.
Members of the Council.—Messrs. Lamont, Cassells and Finch.

It was agreed to reappoint Mr. Carruth as paid Secretary at the usual rate.

Donations.—The resolution that the sum of £2 2s. should be donated to the Victoria Veterinary Benevolent Fund and the sum of £1 1s. to the National Horse Association, was carried.

Address.—The President now called on Mr. Gilmore to give his talk entitled "Reminiscences." Mr. GILMORE delighted the members with recollections of college days in Edinburgh, recounted in his own inimitable way. The members showed their appreciation of Mr. Gilmore's short talk with prolonged applause.

Film Demonstration.—The meeting ended with a very interesting and instructive film demonstration of the treatment of fractures in the dog and cat by the Elastoplast and Cellona technique, provided by the courtesy of Messrs. Smith & Nephew, of Hull.

P. L. SHANKS, *Hon. Secretary.*

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South Eastern Veterinary Association*

MEETING AT TUNBRIDGE WELLS

A meeting of the South-Eastern Division of the N.V.M.A. was held at the Castle Hotel, Tunbridge Wells, on November 10th, 1938, at 3 p.m.

The President, Mr. F. Crowhurst, occupied the Chair and the following Fellows signed the attendance book: Messrs. A. J. Beeson, W. P. Blount, J. W. Bruford, J. G. Cattell, F. A. Crowhurst, A. T. Crowther, J. B. Dier, H. Scott Dunn, J. G. E. Gallie, F. C. Gillard, H. Gooch, H. P. Hogben, J. F. Macdonald, F. Marks, R. F. Montgomerie, L. P. Pugh, C. Roberts, C. Rose, F. B. O. Taylor, H. Taylor, A. Whicher and A. Thomson (Hon. Secretary). The following visitors were present: Messrs. R. C. U. Fisher, S. Gourley and J. Roberts.

Apologies for absence were received from: Sir Frederick Hobday, Messrs. E. P. Barrett, J. K. Bateman, J. W. M. Hinton, S. F. J. Hodgman and Professor T. Dalling.

The minutes of the previous meeting, published in the *Veterinary Record* of November 5th, 1938, were taken as read and signed by the President.

Correspondence.—(1) From the Secretary of the Committee *re* The Adrian Jones Statue Appeal Fund, asking if the Society would care to make a donation to this fund. After consideration, the Hon. Secretary was requested to forward the sum of £2 2s. to the Secretary.

(2) From the General Secretary, N.V.M.A., regarding a resolution received from the Society of Veterinary Practitioners. This resolution requests that Divisions of the N.V.M.A. arrange demonstrations of *post-mortem* and laboratory technique within their area. After discussion it was decided to consider this matter again at a future meeting.

Election and Nomination.—Mr. A. J. M. Beeson, M.R.C.V.S., was unanimously elected a Fellow of the Society. Mr. R. C. U. Fisher, M.R.C.V.S., D.V.S.M., of Sidcup, Kent, was nominated for membership by Dr. R. F. Montgomerie and seconded by the Hon. Secretary.

Resignations.—Letters were read from Mr. L. Hughes and Major J. I. Edgar intimating their wish to resign from the Society. These resignations were accepted with regret.

*Received for publication January 20th, 1939.

Address.—The business of the meeting being concluded, the President called upon Dr. R. F. Montgomerie to give his address on "The Potency of Synthetic Medium Tuberculin for Use in the Double Intradermal Test in Cattle."* Tea was taken at the conclusion of the address and then followed the discussion and Dr. Montgomerie's reply.†

A. Thomson, *Hon. Secretary.*

*Published in *V.R.*, December 24th, 1938.
†Published separately in this issue.

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West of Scotland V.M.A.*

A meeting of the above Division of the N.V.M.A. was held in the George Hotel, Glasgow, on Wednesday, December 28th, 1938.

The President, Mr. S. G. Abbott, occupied the Chair and there were also present: Messrs. J. F. Taylor, Peter Meikle, A. M. K. McLeod, Donald Campbell, J. G. McGregor, W. Watt, W. L. Weipers, David Brown, J. M. Mitchell, W. Harley, A. Starke, H. H. Brodie, H. Begg, Jun., Professors W. Robb and G. W. Weir, and the Hon. Secretary. Professor G. F. Boddie and Mr. P. S. Watts were present as visitors.

Before commencing the business of the meeting, the President made reference to the loss sustained by the Division, and the profession, by the death of Mr. James Sommerville. The members stood in silent tribute to his memory.

Mr. Donald Campbell associated himself with the President in his appreciation of the qualities of Mr. Sommerville, and moved that the meeting instruct the Secretary to send a letter of condolence to his relatives.

Mr. J. F. Taylor also spoke of the high regard in which he held Mr. Sommerville.

Mr. Abbott then thanked the members for electing him as their President for the ensuing year, adding: "I will try to emulate the high standards set by past Presidents. I realise that I will be hard put to it to do this—Mr. Watt, my predecessor, has set such a high standard of enthusiasm in his three years of office that I feel somewhat diffident. It must be a great satisfaction to him that as Chairman of the Provisional Committee a very successful Congress has been held in Glasgow, which success was in no small measure due to his energy and enthusiasm.

"I would like also to pay tribute to the work done by the immediate past-President of the N.V.M.A., Mr. Donald Campbell. His work for the profession during the past year has been of such a character and arduous nature, that it is difficult to thank him adequately. He has led the profession with clear-headedness and tact, and I feel that no man could have done more, if indeed as well. I am sure all present must feel proud that this Division should have had the right man at the right time." (Applause.) "I am confident that whatever I do while in the Chair our Secretary, Mr. Thomson, will keep me from most of the pitfalls. I know, from personal experience on the Congress Committee, of the enthusiasm with which he entered into the making of arrangements. He seems to thrive on hard work and has the ideals of the profession at heart.

"In thanking you again for the honour of electing me to this position of trust I can assure you that I will do my best to maintain the dignity of the Presidential chair and to further the interests of the Division as far as it lies within my power to do so."

Mr. Campbell said that he rose to reply to the kind words of the President, inasmuch as Captain Watt was shy—(laughter)—and the Secretary also was shaking his head. With what Mr. Abbott had said of these two gentlemen he was in entire agreement. For his own part anything he had been able to do he had done gladly.

Mr. P. S. Watts, of the Hannah Research Institute, was nominated for membership by the President who, in doing so, welcomed Mr. Watts to the Division and expressed the hope that he would find the meetings both profitable and enjoyable. The Secretary seconded the nomination.

Arising out of the correspondence, a letter was read from the General Secretary, N.V.M.A., thanking the Division for the work done by the members in connection with the Congress and also thanking the Division for their part, along with the other Scottish Divisions, in providing hospitality to the members at the "At Home" on September 4th.

The President agreed to act as the representative of the Division at the Royal Sanitary Institute Congress next year.

A report of the meeting of the Executive Committee outlining the proposed course in Poultry Husbandry was discussed. It was agreed that this course, with minor adjustments, be proceeded with as soon as possible.

It being the turn of the West of Scotland to nominate the President of the Scottish Branch, it was agreed that Mr. Alex Thomson be the nominee.

Arising out of a discussion of the Loveday Report on Veterinary Education it was agreed to send the following resolution* to the Council, N.V.M.A.:

*Received for publication January 16th, 1939.

[*This resolution was mentioned at the meeting of Council, N.V.M.A., the proceedings of which were reported in our issue of January 28th (*V.R.* 51. 4.), and its terms should be read in conjunction with the discussion which took place on that occasion.—*Editor.*]

"That the West of Scotland Division asks the Council of the N.V.M.A. to set up a special committee, to discuss and analyse the Loveday Report and report back to Council.

"That this Division deprecates the action taken by the Editorial Committee in having commented at such length in the *Veterinary Record* on the findings of the Loveday Committee before the Council had considered the matter.

"That the findings of the Loveday Committee are of such a character that very careful thought and analysis is required by the responsible bodies in the profession before they are likely to be in a position to make fair comment."

This concluded the business of the meeting.

ALEX THOMSON, *Hon. Secretary.*

IN PARLIAMENT

The following are among the questions and answers recorded in the House of Commons recently:—

Colonial Veterinary Service

Mr. MARKHAM asked the Secretary of State for the Colonies whether he is aware of the disability under which the Colonial Veterinary Service is suffering as the result of the continued lack of an adviser in animal health at the Colonial Office; and whether he can see his way to make such an appointment forthwith, in accordance with the recommendation of the Lovat Committee?

Mr. M. MACDONALD: The question of reviving the appointment of adviser on animal health, which has been in abeyance since 1922, is at present under consideration. If my hon. Friend will repeat his question in a fortnight's time, I shall be in a position to give him a definite reply.

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Veterinary Education

Mr. PARKER asked the Minister of Agriculture whether his attention has been drawn to the statement in the Report of the Inter-Departmental Committee on Veterinary Education to the effect that veterinary education has been starved, and what steps he proposed to take to remedy this state of affairs?

Sir R. DORMAN-SMITH: I would refer my hon. Friend to the reply given by my right hon. Friend the Chancellor of the Duchy of Lancaster, to questions asked by my hon. Friend the Member for Hitchin (Sir A. Wilson) on February 1st. [Reprinted in our issue of February 11th.—*Editor.*]

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Cattle (Tuberculin Tests)

SIR J. LAMB asked the Minister of Agriculture whether, in view of the general dissatisfaction regarding the interpretation of the readings of the double intradermal test for bovine tuberculosis which exists not only in the veterinary profession but also amongst the owners of cattle in this country, and the danger and financial loss incurred in using any but reliable tests in the eradication of disease from the herds and in the production of milk, he will set up a commission to investigate and report on the matter?

Sir R. DORMAN-SMITH: The adoption of the double intradermal test in this country was the outcome of recommendations contained in the report on "Tuberculin Tests in Cattle: Medical Research Council, Special Report Series, No. 94," published in 1925.

Although it is inevitable that difficulty must occasionally be experienced in the interpretation of any test of this nature, I am not aware that there is general dissatisfaction with the technique of the double intradermal test, either in the veterinary profession or among farmers. I fully appreciate the importance of ensuring that any test employed for the diagnosis of tuberculosis should be as reliable as possible, and whilst I am not satisfied that there is any need for the appointment of a commission, as suggested by my hon. Friend, I can assure him that every aspect of this question is being very carefully watched.

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Animal Medicines

Mr. HOPKIN asked the Minister of Agriculture whether he is aware of the heavy loss caused to farmers by the sale of ineffective or fraudulent animal medicines, drenches, and the like; whether his attention has been drawn to the beneficent effects in South Africa of Act. No. 21 of 1917, and Act No. 13 of 1929, which comprehensively deal with this evil; and whether he will consider setting up a departmental committee to advise him as to the need for similar legislation in this country?

Sir R. DORMAN-SMITH: I am aware that the claims made in respect of some of the animal medicines and the like on the market are exaggerated, but I have no means of estimating the losses suffered in consequence. I am acquainted with the relevant legislation in the Union of South Africa, but I have no information as to its effects. As regards the last part of the question, I will bear the hon. Member's suggestion in mind.

Mr. HOPKIN: Does that reply mean that nothing at all will be done to prevent fraudulent advertisements regarding patent medicines for animals?

Sir R. DORMAN-SMITH: I have told the hon. Member that I will bear his suggestion in mind.

R.C.V.S. OBITUARY

MR. HENRY GRAY, M.R.C.V.S.

It is with deep regret that we have to record the death of Mr. Henry Gray, M.R.C.V.S., of 85, Earl's Court Road, Kensington, W.8, at the age of 73 years. He was a man of strong personality who was for many years a prominent figure in the veterinary life of the Metropolis.

He contributed extensively to veterinary literature and many will recall the vigour of expression which characterised his tenure of the editorial chair of the *Veterinary News*.

The value of his pioneering activities in relation to the professional care of poultry and aviary birds is stressed in the biographical tribute from a colleague which we are glad to publish below, while in connection with his extensive all-animal practice mention should be made of the many useful appliances he introduced to facilitate the examination and control of dogs and cats. Mr. Henry Gray passed away in a Kensington hospital, following a long period of ill health, on Friday of last week.

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An Appreciation

On February 17th, 1939, Henry Gray, one of the most vivid personalities of the veterinary profession, passed to his rest.

Henry Gray was born on March 18th, 1865, at Dagenham, in Essex, the eldest son of Alfred Gray, who succeeded to the farm which had been tilled by many generations of the Gray family. His mother, Victoria Hastings Farrow, was the daughter of William Farrow, the first of four generations of graduates from the Royal Veterinary College. On leaving Buxton College at 13 years of age, Henry helped on his father's farm until he entered the Royal Veterinary College, where at 20 years of age he graduated M.R.C.V.S., on December 10th, 1885. For the next two years he was assistant in the cattle and colliery practice of Mr. Thomas Green, M.R.C.V.S., of Hucknall, in Nottinghamshire. Until 1890 he was assistant to Mr. Hack, M.R.C.V.S., of Leicester, where on December 18th, 1890, he married his first cousin, Lavinia Grace Farrow, whose father and brother were veterinary surgeons with large horse practices in London. Soon after his marriage he moved to London, starting practice on his own account in Kensington.

In Kensington Henry Gray rapidly built up a flourishing mixed practice; from the outset he studied dogs, small animals and birds in addition to horses and cattle. He possessed an unusual energy of mind and body; his voracious appetite for knowledge kept him at his books every night however arduous the day's work had been. He was blessed with a remarkably good memory. His surgical ability became known among his colleagues, resulting in the steady growth of consultant work throughout the country. During these early days in Kensington he formed a friendship with the late William Hunting, which he frequently referred to in later years as one of the great blessings of his life.

Under the influence of William Hunting, Henry became attracted to professional journalism and developed his powers of exposition. Over a long period he was a regular contributor of scientific articles and addresses to the *Veterinary Record* and *Veterinary Journal*. He revised Fleming's "Practical Horse Keeper." He contributed important sections to Wallis Hoare's "System of Veterinary Medicine" and "Veterinary Therapeutics," also to Wooldridge's "Encyclopaedia." To his intimate friend William Hunting he dedicated his translation and enlargement of Dr. Nicolas's "Veterinary and Comparative Ophthalmology." His knowledge of veterinary history was of value to another friend, the late Sir Frederick Smith, who was compiling the four volumes of "The History of

Veterinary Literature." It was Henry Gray who unearthed Viborg's discovery in 1791 that glanders could be transmitted to healthy horses by transfusing them with the blood of glandered horses, thus anticipating Coleman's work of the following century. During the illness of his friend, Wallis Hoare, he took over the editorship of the *Veterinary News*. By the constructive criticism of his editorial pen Henry Gray played a not negligible part in securing the amendment to the Veterinary Surgeons Act.

With the pen, as on the platform, Henry felt it was a mistake on big issues only to say smooth things. His mind was acute, he lived with ideas and in their exchange he was fearless and did not hesitate to reveal his emotion. "Some take criticism as a personal affront: I look upon it as a game," was one of his aphorisms. His political views were founded upon a deep knowledge of and respect for our profession's past and an intelligent appreciation of its present capabilities. Vigorous, combative and passionate though he was, he only concerned himself with the big issues which might contribute to or mar our profession's progress. With him controversy might become passionate, but it never grew embittered, and to speak slightingly of an opponent was foreign to him. There was nothing small about Henry Gray.

One remembers his saying towards the end of his career, "The monument of a profession is its literature." A claim can be justly made that Henry Gray, a busy veterinary practitioner, was one of the foremost among his contemporaries in building up the monument we possess to-day. His library, like the man, was big; it reflected his resilient, progressive mind. Until recent years of poor health he kept abreast of American, French and German veterinary literature. Many will recall finding the Henry Gray of later years seated at his desk, which was stacked high with journals and papers. The only small thing in the picture was the space left for his writing pad; even his pen contributed to the massive effect of the man and his setting. As he wheeled round in his chair to talk his actions were as vigorous as his speaking; no time was to be lost in sharing with a friend whatever idea was uppermost in his mind. And then there was his smile, sometimes puckish, always kind.

Probably his old friends and contemporaries of the Central Division, N.V.M.A., will recognise his best period in public debate as the first 20 years of this century. He had been a regular and enthusiastic supporter of the Central's meetings, and he derived lasting pleasure from the award in 1933 of the Victory Medal. But few of the Society, which had honoured him and his work, will have appreciated in recent years the nature of the ill health against which he contended. As in his vigorous days, acute observation, experience and a vivid mind would provide him with much to contribute to discussions; but after a few sentences difficulty in breathing would affect his enunciation, and annoyance at his failing powers would lead him to repetition and sometimes to asseveration. He was not so troubled when able to sit at his ease; thus in later years his fireside was the scene of his best contributions to professional thought and politics.

The study of birds was his first and enduring delight; in later years nothing gave him greater satisfaction than a fireside talk about birds. He would recall the days of his youth on his father's farm or how in his love for the country he would tear off from Kensington for a Sunday to lie for hours smelling the earth and the dankness of some hedgerow, from which he would watch the birds of our fields, oblivious of the stiffness in his neck or the emptiness of his stomach. There was much of W. H. Hudson in Henry Gray. His home, often to the discomfort of his family, was full of aviary birds. From his field observations and reading Henry had acquired a profound knowledge of the behaviour and identification of birds in the feral state and of their husbandry under confinement. Among the breeders and fanciers of small animals and birds he was the most widely known member of the veterinary profession. In this country he was the veterinary pioneer of the scientific study of birds in health and disease. For many years he was scientific adviser to several avicultural societies and to the journals of the bird and small animal fancies, among whom his "Poultry Diseases" (1923) and "Diseases of Cage and Aviary Birds" (1936) were widely read.

Henry's life work was in the heart of London; but each morning on rising he visited his birds. They symbolised his soaring mind which for a while would escape to the countryside of his youth. Thus he began the day's work refreshed by the beauty and wealth of nature.

His wife predeceased him in 1934; of their five children he leaves two sons and two daughters.

TOM HARE.

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THE FUNERAL

The funeral service was held at the private chapel at 81, Westbourne Grove, W., on Tuesday afternoon last, when many relatives and friends were present, the latter including the following members of the veterinary profession: Mr. P. J. Cautley (representing the National Veterinary Medical Association), Dr. Tom Hare, Sir Frederick Hobday, Mr. E. B. Ince, Mr. N. S. King (representing the Central Veterinary Society), Mr. F. E. Mason (of Austria, at present in London), Mr. W. Perryman, Mr. T. J. Richardson and Mr. F. H. Stainton.

The interment followed at Putney Vale Cemetery, where again a large company gathered, and there was a great number of floral tributes. Dr. J. McCunn joined his colleagues at this portion of the funeral ceremony.

Drummond, David, 7, Powderham Road, Newton Abbott, Devon. Graduated Glasgow, July 20th, 1936. Died February 18th, 1939; aged 59 years.

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King, George Edward, Abingdon, Berks. Graduated London, March 31st, 1885. Died February 5th, 1939.

Mr. G. E. King, M.R.C.V.S.

Mr. George E. King, whose death took place very suddenly at Lawrence Hall, Ham Common, Surrey, practised for over 25 years in Abingdon, where his work lay largely among the racing studs in the neighbourhood. Mr. King held the appointments of Veterinary Inspector under the Ministry of Agriculture and also the Berks C.C. for the northern part of the county, until he retired in 1921.

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Robinson, Robert Craig, 18, Aglionby Street, Carlisle, Cumberland. Graduated N. Edinburgh, May 23rd, 1895. Died February 16th, 1939; aged 66 years.

Mr. R. Craig Robinson, M.R.C.V.S.

We record with much regret the sudden death of Mr. Robert Craig Robinson, M.R.C.V.S., who was one of the best-known veterinary surgeons in the North of England. Mr. Robinson collapsed and died at Carlisle Auction Mart, while examining a horse.

A native of Carlisle, he had acted as veterinary inspector for Carlisle Corporation for over 40 years. Mr. Robinson received his early education in Carlisle, qualifying as a veterinary surgeon at Edinburgh, and continuing his studies in Paris. He held several appointments under the Ministry of Agriculture in connection with the licensing of stallions, and as a member of the Ministry's panel for the eradication of tuberculosis. He took a keen interest in the Society for the Prevention of Cruelty to Animals. One of his sons, Mr. William G. Robinson, B.Sc., M.R.C.V.S., D.V.S.M., has been a partner with his father for some time.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Feb. 27th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

Feb. 28th.—Meeting of the Derbyshire Division, N.V.M.A., at Sutton Bonington, 2.30 p.m.

March 2nd.—Voting Papers for R.C.V.S. Council Election issued to members overseas.

Mar. 2nd.—Meeting of the Central Veterinary Society, at Conway Hall, W.C.1, 6.30 p.m.

Mar. 8th.—Meeting of the Lancashire Division, N.V.M.A., at Manchester, 2.30 p.m.

Mar. 10th.—Annual General Meeting of the Southern Counties Division, N.V.M.A., at Salisbury, 2.30 p.m.

Mar. 17th.—Meeting of the Welsh Branch, N.V.M.A., at Cardiff.

Mar. 17th.—Annual Dinner and Dance of the Yorkshire Division, N.V.M.A., at Leeds.

April 1st.—Annual Fees due to R.C.V.S.

April 12th.—R.C.V.S. Committee Meetings.

April 13th.—R.C.V.S. Committee Meetings.

April 14th.—R.C.V.S. Committee and **Council** Meetings.

May 4th.—R.C.V.S. Council Election. Last day for nominations.

May 8th.—Animal Management Examination begins.

May 15th.—Rome Congress on Comparative Pathology begins.

May 18th.—R.C.V.S. Council Election Voting Papers issued.

May 25th.—R.C.V.S. Council Election Voting Papers due.

June 1st.—**Annual General Meeting, R.C.V.S.**

June 8th.—D.V.S.M. Examination begins.

June 20th.—R.C.V.S. Committee Meetings.

June 21st.—R.C.V.S. Committee Meetings.

June 21st.—**R.C.V.S. Annual Dinner.**

June 22nd.—R.C.V.S. Committee Meetings.

June 23rd.—R.C.V.S. Committee and **Council** Meetings.

July 23rd—28th.—N.V.M.A. Congress at Great Yarmouth and Gorleston-on-Sea.

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R.C.V.S. COUNCIL ELECTION

A further nomination has been received namely, that of Mr. H. W. Steele-Bodger, of Tamworth. His proposers are Sir Frederick Hobday and Mr. H. W. Dawes. This makes 13 candidates for eight vacancies.

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CONTAGIOUS ABORTION AND STERILITY "REMEDIES"

Complaints have recently been received by the N.V.M.A. with regard to the alleged failure of certain "remedies" for the treatment of contagious abortion and sterility in cattle, sold direct to farmers by the manufacturers of these preparations. These complaints are being investigated by a committee of the Association and it would be appreciated if members of the profession who may know of similar cases would send full particulars to the General Secretary, N.V.M.A., 36, Gordon Square, London, W.C.1, for the information of this committee.

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PERSONAL

The King's Investiture.—On the occasion of the second Investiture of the year, held by His Majesty at Buckingham Palace on Thursday of last week, the King invested Mr. John Willett, M.R.C.V.S., with the Insignia of the Royal Victorian Order, into which he has been admitted as notified in the New Years' Honours List.

"REFUGEE" ANIMALS ON THE SPANISH FRONTIER

Despatch of R.S.P.C.A. Veterinary Unit

In consequence of the receipt of a report from representatives of the R.S.P.C.A. (sent to make enquiries) on the appalling conditions prevailing amongst the "refugee" animals on the Franco-Spanish Frontier, Captain Fergus MacCunn, Chief Secretary, within 48 hours organised and despatched a veterinary unit, which left London on February 15th for Perpignan under the leadership of Colonel Robert J. Stordy, C.B.E., D.S.O., M.R.C.V.S.—who, it will be remembered, took the R.S.P.C.A. unit to Abyssinia during the Italo-Ethiopian War—with Mr. D. H. Sheppard, M.R.C.V.S., as principal assistant.

The situation with which the R.S.P.C.A. was confronted was so extraordinary, as is recorded in the following extracts from the report referred to above, that no more definite instructions could be given than the unit should immediately attempt to proceed with the watering and feeding of horses, and subsequently to give what veterinary attention was practicable under the circumstances.

The report states: "At St. Cyprien we found a camp of some 12,500 Spanish Government troops. St. Cyprien is right on the Mediterranean and the camp is situated in some sand dunes. Conditions were in a state of indescribable confusion; men, mules, horses, sheep and goats were all lying on the ground exhausted. There was no fodder whatever for the animals and no water for them. There was only one spring which was being controlled by the French authorities, and queues of men, over a quarter of a mile long, were waiting to obtain water to drink. No one had time to deal with the animals.

"The whole of the land is given over to vines and there is hardly any meadowland. What little grass there is, is very poor and the countryside does not seem, even in peace time, to support any milch cattle, simply mountain goats and a few sheep. The result was that these animals could not find much sustenance and, after their privations, had little hope of recovery without attention. Some horses had suppurating sores, a few were lame and had superficial wounds and they were very thin. The mules were in better fettle, though many of them were exceedingly debilitated. A few dead animals were lying about. . . . We bitterly regretted that the French authorities would not allow us to take killers so that we could have dispatched the many animals *in extremis* to save them further suffering. A number of animals are in such a state that obviously they will not recover, but the main trouble is complete lack of both food and water. . . .

"At le Boulou, a centre for refugee civilians and their animals, only three miles from the frontier, women, children, horses, mules, fowls, and a few goats are all out in fields which are completely bare of grass. Complete chaos reigns and the animals have no food whatever. Many are in a pitiable condition and unless help comes to them quickly, the mortality will be heavy. I estimate there are 250 horses and mules at this place.

"The French are doing their utmost to cope with the situation but I understand that 400,000 refugees have recently poured into France and their transport is unable to cope with the strain put on it.

"I then returned to Perpignan and met the *Daily Express* and the *Daily Mail* representatives, having previously located where they were in the town. I asked for their opinion on our Society sending a unit. Mr. Paul Bewsher, the *Daily Mail* correspondent, said: '*I am delighted to see a representative here from your excellent Society. Help is urgently needed and I would strongly advise your veterinary unit being sent.*' He asked me of what it consisted and I explained to him. He further told me that at Bourg Madame several thousands of sheep and cattle had been put into fields and were dying in scores. I heard similar stories from other Pressmen and, in view of the three thousand animals at St. Cyprien, it seemed to me to justify my telephoning to you suggesting that the unit should be sent out immediately, speed being an essential."

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In a letter, addressed to us on Monday last, the Chief Secretary observes, in reference to the above: "We have just received further details from our unit in Perpignan. They report that they are co-operating with the French authorities and that all the animals are being fed and watered. The unit has been able to give veterinary attention in many cases and Colonel Stordy states that the French Veterinary Services have been delighted to accept his offer of surgical dressings, etc., which the unit took out to France, as apparently these have run rather short.

"It would certainly seem as though the situation is well in hand, and we are glad to think we have been able to render assistance."

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ULSTER MINISTRY'S COD LIVER OIL WARNING*

A warning to poultry-keepers with regard to the purchase of cod liver oil is issued by the Northern Ireland Ministry of Agriculture.

In a recent survey 14 samples of oils were bought from shops at various places throughout the Province. In every case "cod liver" was asked for when the purchase was made. When they were examined chemically it was found that eleven of the 14 samples were not cod liver oil at all but were worthless substitutes. Some were shark oils, some were whale oils and some even were grossly adulterated with mineral oils.

"As a source of vitamin D," the Ministry points out, "such oils are worthless. Only three were cod liver oils, and two of the three were oils of very inferior quality. Thus it is not sufficient to ask simply for 'cod liver oil.' It is necessary to demand a tested and guaranteed cod liver oil."

*The attention of our readers is drawn to the annotation on the subject of cod liver oil and animal husbandry published in this issue.

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EXPANSION OF THE PASTEUR INSTITUTE

"In 1884 Louis Pasteur started a laboratory in Garches, a suburb of Paris, and it was here that diphtheria antitoxin was prepared for the first time," writes the Paris correspondent of the *Lancet* in a recent issue. "The Garches institute was somewhat put into the shade by the new one which came to be known as the Pasteur Institute of Paris, and it might have been relegated to unenterprising obscurity but for Gaston Ramon who during the past 15

years has made its name famous by his investigations of diphtheria and tetanus. As his work has grown the original buildings in Garches have become too small and new laboratories have had to be built for the production of anatoxins (toxoids), for the study of antigens and antibodies, and for testing recent discoveries. These new laboratories were formally opened on December 22nd last by the minister of public health who took the occasion to decorate Ramon with the collar of a commander of the Legion of Honour."

It will be a source of gratification to veterinarians the world over to witness the mark of great distinction conferred upon our profession by the fact that the spokesman on this historic occasion was the brilliant veterinarian, Professor Ramon. His colleagues in this country will join in congratulating him upon the receipt of the distinction of commander of the Legion of Honour. It is indeed a source of pride to the profession that the mantle of Pasteur should fall on the shoulders of our genial and eminent contemporary.

"In a brief address Professor Ramon traced the history of the Garches institute since 1884. From the study of rabies its staff had passed to that of diphtheria and then to that of tetanus, and the preparation of anti-diphtheria and anti-tetanus sera had assumed large proportions. He claimed on behalf of his anatoxin that it had reduced the diphtheria mortality by about three-quarters in ten years in Paris, where only 50 per cent. of the children were inoculated; it had reduced the mortality by more than nine-tenths in New York where 80 per cent. of the children were inoculated; and it had practically stamped out diphtheria in Canada where almost every child is inoculated. Turning to the anatoxin prophylaxis of tetanus, he said that the ten-year application of this system to army horses had rid the French cavalry of the disease. Compulsory inoculation against tetanus had been in force among the French troops since the law of August 16th, 1936, had become effective. The simultaneous immunisation of the army against diphtheria, tetanus, and typhoid fever had caused no inconveniences marring to the successes achieved. Professor Ramon added that the new processes devised at Garches had yielded, in a quarter of the time formerly required, antitoxic sera from five to ten times more active than before."

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"THE CITADEL": BOOK AND FILM

We sympathise entirely with the criticisms made by our medical contemporary, the *British Medical Journal*, in the following annotation for as much as we realise that a similar species of misconception is deeply implanted in the public mind regarding the professional veterinarian.

"The award of the highest American honour for a 1938-made film in the English language to the production adapted from Dr. A. J. Cronin's 'best seller' has naturally a special interest for the medical profession because of the predominantly medical implications of the plot. Exactly how far, if at all, the author of the book intended his work of fiction to be regarded as a tract has been the subject of widely differing views. The public greedily absorbed the notion, probably fostered by the publisher and his advertising agents, that it was meant as a genuine and savage satire on 'Harley Street' and all its ways—by which term they understand the whole body of London consultants, regardless of the fact that the geographical area in question houses types of practitioner as far asunder as the poles in scientific distinction and in devotion to the public weal. The public was probably wrong: just as Dr. Cronin would not pretend to have produced a literary masterpiece or an important work of propaganda. He is first and foremost a story-teller—and at the moment has few superiors in that craft in England; and in *The Citadel* he used his medical training and experience to aid him in telling a story which has had a most remarkable success. Fiction is not evidence on oath; and we cannot demand of a medical novelist that he shall subordinate his plot or his 'local colour' to accuracy in matters of detail. The main fault we had to find with this very readable book was the way in which the exceptional was overemphasised so as to make it appear the usual. When the film magnates, in their turn, commission a producer to turn a novel into a talking film, their aim is neither instruction nor political propaganda, but the more commercial aim of amusing and interesting their patrons; these include all classes, and among them the unsophisticated are in an immense majority. It is box-office returns, not art or literature, or education or social betterment, that the film industry is after; whether in the process the public gets right or wrong impressions on this or that subject is of small importance compared with the financial results, which in turn depend on tickling the ears (and eyes) of the groundlings. Thirty years or more ago one remembers that Mr. Somerset Maugham (a medical man) put on the stage a scene in which a young consulting physician in 'Harley Street,' hard put to it because his practice was very meagre, contemplated scattering orange peel on the pavement outside his rooms in the hope of getting some sprains or broken legs to treat as a result. The playwright, of course, had his tongue in his cheek, as the medical members of his audiences knew, but the rest of the world saw nothing abnormal in the incident. Similarly, the film version of Dr. Cronin's book abounds in glaring and much more serious medical solecisms, which will go unperceived by the laity, though his professional brethren detect them easily enough. The question for us is not whether this film is well produced and well acted, but whether it gives a distorted view of medical life and medical morals, and if so, how far it is calculated to lower our profession in the eyes of the public. Its qualities as a film are a matter for cinema critics; they have been discussed in all the lay papers and do not much concern doctors as doctors. In our view *The Citadel* film, apart from its absurdities, gives a false impression of British medicine and British doctors, which in the long run will do harm unless the public regard it merely as entertainment. Anything that lowers prestige by so much lowers confidence, and confidence is the chief element in the doctor-patient relationship."

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Sir Richard Brooke, the well-known horse breeder, told the Worcestershire Agricultural Committee recently that when many of the British cavalry regiments were mechanised and the remounts sold, the buyers were the Germans, who found that mechanised transport was not in every way satisfactory. Sir Richard Brooke was formerly in the Scots Guards.